NAVAL POSTGRADUATE SCHOOL

Monterey, California

THESIS

ALLOWANCE TYPE CODE SEVEN MATERIAL:
AN ANALYSIS OF THE CURRENT
DISPOSAL SYSTEM

by

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December, 1989

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URITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

REPORT SECURITY CLASSIFICATION CLASSIFIED	1b RESTRICTIVE MARKINGS NONE
SECURITY CLASSIFICATION AUTHORITY DECLASSIFICATION/DOWNGRADING SCHEDULE	3 DISTRIBUTION/AVAILABILITY OF REPORT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED
ERFORMING ORGANIZATION REPORT NUMBER(S)	5 MONITORING ORGANIZATION REPORT NUMBER(S)
NAME OF PERFORMING ORGANIZATION val Postgraduate School — 6b OFFICE SYMBOL (If applicable) CODE 36	7a NAME OF MONITORING ORGANIZATION Naval Postgraduate School
ADDRESS (City, State, and ZIP Code) nterey, CA 93943-5000	7b. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000
NAME OF FUNDING/SPONSORING GANIZATION — 8b OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS Program Element No / Project No / Task No / Work Unit Accession Number

TITLE (Include Security Classification)
LLOWANCE TYPE CODE SEVEN MATERIAL , AN ANALYSIS OF THE CURRENT DISPOSAL SYSTEM

PERSONAL AUTHOR(S) NABER, JAMES P.

a. TYPE OF REPORT	13b TIME COVERED	14. DATE OF REPORT (year, month, day)	15 PAGE COUNT
ster's Thesis	From To	DECEMBER 1989	107

SUPPLEMENTARY NOTATION
e views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. vernment.

COSATI CODES			18. SUBJECT TERMS (continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUBGROUP	A REVIEW OF THE DISPOSAL SYSTEM FOR ALLOWANCE TYPE CODE SEVEN MATERIAL WITH RECOMMENDATIONS FOR IMPROVEMENTS AND POSSIBLE CHANGES

ABSTRACT (continue on reverse if necessary and identify by block number)

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DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS REPORT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
a. NAME OF RESPONSIBLE INDIVIDUAL APT. T.H. HOIVIK, USN / DR THOMAS P. MOORE	22b. TELEPHONE (Include Area code) (408) 646- 2744 / (408) 646-2642	22c OFFICE SYMBOL 55HO / 54MR

D FORM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete — SECURITY CLASSIFICATION OF THIS PAGE

Approved for public release; distribution is unlimited.

Allowance Type Code 7 Material: An Analysis of the The Current Disposal System

by

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MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL
December 1989

ABSTRACT

The purpose of this thesis is to evaluate the current system for the disposal of Allowance Type (AT) Code 7 material from submarine tenders, focusing specifically on material with an extended cost less than $20. The current disposal system will be analyzed and improvements recommended. Alternative disposal systems will also be identified for possible consideration. Although this thesis addresses only submarine tenders that have relatively large amounts of AT Code 7 material, the conclusions should be applicable to low value excess material on other ships.

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CHAPTER ONE: INTRODUCTION

A. PURPOSE

The purpose of this thesis is to evaluate the current system for the disposal of Allowance Type (AT) Code 7 material from submarine tenders, focusing specifically on material with an extended cost less than $20. The disposal system will be analyzed and improvements recommended. Alternative disposal systems will also be identified for possible consideration.

This thesis will be divided into three major sections:

- The first section will review the current system for disposal of low cost excess material.
- The second section will develop a baseline cost for the current system.
- The third section will recommend improvements to the current system and possible alternatives that may lower costs.

In an era of shrinking budgets some possible alternative methods for reducing the costs of disposal of low value excess material should be investigated. Although this thesis addresses only submarine tenders, which have relatively large numbers of AT

Code 7 material, the conclusions should be applicable to low value excess material in other ships. When the possible savings are multiplied across the entire Navy Supply System, they may be significant.

B. BACKGROUND

As a result of monthly changes to shipboard Coordinated Shipboard Allowance Lists (COSALs) and Tender Load Lists (TLLs) many spare parts are moved from an allowed spares category to an excess material category. Allowance type codes identify the particular categories of spares carried aboard a ship with Allowance Type Codes 6 and 7 being assigned to excess material. On small combatants, all excess is labelled with an allowance type code 6. On larger platforms carrying Navy Stock Fund material, excess parts are divided into two groups: those items with an extended money value greater than $100 and those items with an extended money value of less than or equal to $100. On such platforms AT Code 6 is assigned to material greater than $100 and AT Code 7 is assigned to material less than or equal to $100.

Submarine and destroyer tenders and aircraft carriers are examples of ships that carry both ship's parts and Navy Stock Fund parts. Such platforms are often referred to as Shipboard

Uniform Automated Data Processing System (SUADPS) 207 ships in reference to the data processing system that controls their logistic functions. A SUADPS 207 ship carries allowance type code 6 and allowance type code 7 material. The ships offload AT Code 6 material periodically (usually once a month) to reduce unauthorized long supply figures.

AT Code 7 excess material and some AT Code 6 excess material are left onboard a ship until an overhaul period or integrated logistics overhaul period occurs. At this point they are offloaded and sent to the nearest stock point. AT Code 7 material is not worth moving out of the storeroom to the supply center on a periodic basis. However, this material does take space in storerooms that could be used more productively. There is significant expense involved in moving this material (whose condition after being onboard ship for several years is suspect) and trying to integrate it back into the Navy Supply System.

The primary issues that will be analyzed in this thesis are:

1. What are the major costs involved in how the system for disposal of AT Code 7 material is organized?
2. Is the current system really cost effective?

3. If these items are not worth moving when stored on a ship, is it cost effective to process them back into the supply system?
4. Would it be cheaper to just dispose of parts at sea?
5. Are there alternatives to the current disposal process for AT Code 7 material?

C. LIMITATIONS

There is very little written about the disposal of low dollar value excess material. Most of the supply activities investigated did not keep records of many of the costs involved in the process. Most of the cost information was obtained from estimates made by the people involved in the particular activity. Therefore, precise estimation of the costs involved was difficult and considerable judgement was used in deriving the cost estimates.

The composition of the work force and labor wages vary from one area to another. The research was accomplished primarily at California naval activities that tend to have slightly higher costs than the rest of the naval activities.

CHAPTER TWO: TRACING THE CURRENT SYSTEM

A. INTRODUCTION

This chapter addresses the current system for turning in allowance type code seven material. The discussion will trace excess material from the time it leaves the ship to its ultimate destination. The rationale for this structure and the directives that give the system its foundations will be examined. As such, the chapter has four major sections:

- Disposal of AT Code 7 material at the shipboard level
- Disposal of At Code 7 material at the Integrated Logistics Overhaul (ILO) site
- Disposal of AT Code 7 material at the Supply Center/Depot level
- The low cost excess centers: ISSOT at NSC Oakland and NSC Norfolk

B. SHIPBOARD LEVEL

As a result of changes in demand and changes in equipment configuration, all ships carry repair parts onboard that are no

longer required. This material reduces storeroom space and ties up assets that other platforms may require.

1. Excess Part Generation

There are basically three methods by which excess material is created onboard a vessel:

a. COSAL Maintenance

The Ships Parts Control Center (SPCC) publishes a revised Coordinated Shipboard Allowance List (COSAL) monthly for every platform in the Navy. The COSAL is designed to reflect the latest changes in repair part loading and any configuration changes that occurred in the recent (and sometimes not so recent) past. COSAL changes increase, reduce or delete parts from a ship's parts allowance list. When a COSAL change reduces or deletes a stock numbered item from a ship's allowance list, any onboard stock in excess of the new allowance quantity for the part moves to an excess category. The allowance type (AT) codes identify a part as allowed ship stock (AT code 1 or 3) or excess (AT code 6 or 7).

b. Load List Maintenance

Load list maintenance changes the amount of Navy Stock Fund material onboard a SUADPS 207 ship. Load list

maintenance is similar to COSAL maintenance. SPCC forwards a monthly tape to reflect the latest changes in the tender load. As with COSAL maintenance, the new load lists move parts to an excess category (AT code 6 or 7) from an allowed category (AT code 2 or 3).

c. *Miscellaneous*

Other sources of excess material include: incorrectly ordered parts, excessive numbers of ordered parts, and material turned into the supply officer from divisional "ready spares" lockers.

2. Excess Material Control

The Supply Management Afloat Guide, NAVSUP Pub-485 stresses the increasing importance of "identification and purging of excess stock...in the inventory cost function."[Ref. 1] Most ships spend very little time trying to accomplish this guidance. There is not enough time nor resources to adequately screen and remove the amount of excess material that has accumulated over several years.

The nature of a ship's supply parts determines how the removal of excess is approached. There are basically two

categories of ships which vary according to the parts they carry, end-use and Navy Stock Fund.

a. End-use

For end-use platforms, excess material generally remains in the storerooms until the ship undergoes an overhaul. During the overhaul process, a team composed of shipboard members supervised by the Integrated Logistics Overhaul (ILO) site will go aboard the ship and offload all repair parts to warehouses on the pier. For the next several months the inventory will be verified, counted, and returned to the ship. All the excess material will be purged.

When a ship completes its overhaul, it should have a refined COSAL with no excesses or deficiencies. In actual practice this is not always the case. ILOs do not always accomplish their objectives and not all ships will undergo this updating process. Excess material may be carried for several more years until the next overhaul or until the ship's supply officer directs it to be offloaded (an unlikely occurrence).

b. Navy Stock Fund Ships

Navy Stock Fund (or SUADPS 207) ships constantly offload excess material from their inventories. They submit

monthly reports that outline how much excess they are carrying. The fleet commander allows a certain percentage of excess material per ship. This is approximately 5% of total inventory value for both Pacific fleet and Atlantic fleet submarine tenders.[Ref. 2] To stay within these goals, SUADPS 207 ships must continually review their inventories and offload excess material.

Excess material on a SUADPS 207 ship falls into two categories: AT code 6 and AT code 7 material. AT code 6 material has an extended money value greater than $100.00. AT code 7 material has an extended money value of less than $100.00. SUADPS 207 ships normally do not offload AT code 7 material since they are judged by the total dollar value of the material unloaded and not by the number of line items. Therefore, AT code 7 material typically remains in storerooms until the ship goes through an overhaul period. Pacific fleet tenders usually go through incremental overhauls which do not allow enough time for a full ILO and offload of excess material.

AT code 7 material may begin to present a stowage problem when it begins to accumulate after several years. This is evident from Table I. Table I contains a breakdown

of AT Code 7 material from four different submarine tenders, separated by number of line items and dollar amounts per line items. Ships that have not undergone a recent ILO period tend to have larger AT Code 7 inventories. For example, the USS PROTEUS (AS-19) has not undergone a full overhaul since 1981. The ship has more AT 7 parts than the other three tenders combined.*

* Another contributing factor to the large amount of AT code 7 material is the wider range of parts that the PROTEUS must carry to support the many different classes of submarines that the ship must maintain.

TABLE I: NUMBER OF LINE ITEMS AND DOLLAR VALUE OF AT 7 MATERIAL ON FIVE SUBMARINE TENDERS

SHIP	USS DIXON				USS PROTEUS				USS HUNLEY			
UNIT COST	LINES	VALUE($)	% LINES	% VALUE	LINES	VALUE($)	% LINES	% VALUE	LINES	VALUE($)	% LINES	% VALUE
$0-5	3650	38850	59.3%	24.6%	6341	11426	40.4%	3.9%	3464	6869	39.3%	4.9%
$6-10	789	30067	12.8%	19.1%	2510	16094	16.0%	5.5%	1387	10096	15.7%	7.2%
$11-25	903	39602	14.7%	25.1%	2769	49537	17.6%	17.0%	1904	31173	21.6%	22.1%
$26-50	477	25191	7.8%	16.0%	2158	77616	13.7%	26.7%	1371	48251	15.5%	34.2%
$51-100	333	23949	5.4%	15.2%	1929	135960	12.3%	46.8%	691	44672	7.6%	31.7%
TOTAL	6152	157659			15707	290633			8817	141061		

SHIP	USS LY SPEAR				USS MCKEE			
UNIT COST	LINES	VALUE($)	% LINES	% VALUE	LINES	VALUE($)	% LINES	% VALUE
$0-5	1570	2653	27.2%	3.5%	1345	14729	72.3%	40.6%
$6-10	486	3501	8.4%	4.6%	192	5462	10.3%	15.1%
$11-25	750	12249	13.0%	16.2%	189	7613	10.2%	21.0%
$26-50	507	20453	8.8%	27.0%	66	3518	3.5%	9.7%
$51-100	2451	36895	42.5%	48.7%	68	4917	3.7%	13.6%
TOTAL	5764	75751			1860	36239		

ALL SHIPS AVERAGE	LINES	VALUE($)
$0-5	3274.0	14905.40
$6-10	1072.8	13044.00
$11-25	1303.0	28034.80
$26-50	915.8	35005.80
$51-100	1094.4	49278.60
TOTAL AVG		140268.6

C. INTEGRATED LOGISTICS OVERHAUL (ILO) SITES

The ILO period is the time for a ship to check whether the repair parts it carries support the equipment that is installed onboard. Material that has been offloaded from a ship is screened through a computer program that matches what is on hand with what is required. The computer then generates excess lists and shortage lists. The shortage quantities are requisitioned, and the excess list is placed on computer tape and is forwarded to the nearest supply center. The supply center will produce either a DD Form 1348-1 or a similar bar-coded form to identify the quantity and type of material. Members of the ILO team will attach the bar-coded documents to the material. They will then segregate the material for shipment to the supply center. AT Code 7 excess material is divided into two groups: those parts with greater than $20.00 extended money value and those parts with less than $20.00 extended money value. The two categories of material are forwarded separately to the nearest supply center.

D. SUPPLY CENTERS

The supply center's responsibility is primarily as a staging and redistribution point for the excess material that comes in. Excess

material flows into the Material Turned Into Stores (MTIS) section of the supply center from various commands. MTIS personnel may pull material to fill local requirements, forward material to other supply activities or send the material to the Defense Resources Management Organization (DRMO).

1. Less than $20.00 material

This category of material should already be segregated upon arrival at the supply center. The supply center simply forwards the material to the Improved Material Returns (IMR) sites operated by the Integrated Supply Support Outfitting Teams (ISSOT) at NSC Oakland or Portsmouth, VA. In accordance with the Supply Management Afloat Guide, NAVSUP PUB-485, the Type Commander (TYCOM) receives no credit for this material [Ref. 1, para. 5066] Based on the amount of material turned into the IMR sites in fiscal year 1989, it is essentially a $1,000,000 gift to the Navy Supply System.

2. Greater than $20.00 material

The MTIS section of the supply center will screen this excess material against their own requirements to determine whether it should be retained on their shelves as Navy retail stock. For large offloads of excess material, most supply centers require

a prescreening before the material arrives. During the prescreening, the supply center will check the material against their shortages to determine if they have an outstanding requirement for the material. If there is no requirement for the excess material, the supply center will query the appropriate integrated material manager (IMM) at the inventory control point via the Defense Automatic Addressing System (DAAS) for disposition instructions.** When the excess matches a requirement elsewhere, the IMM sends forwarding instructions.[Ref. 3]

If no requirement exists for the material, the IMM is supposed to issue distribution instructions, either for temporary retention in stock or disposition to DRMO. Anywhere from 15-40% of the excess material may fit into this category. Much of this material may wait two months or more for final resolution. The MTIS department will eventually forward approximately 50% of the material left in this indefinite category to the nearest DRMO.[Ref. 4]

**The supply center will send an FTE query through DAAS to the ICP. The IMM responds via an FTR in one of four ways: [1]Take the material into back into the supply center and give credit for it. [2]Take the material back into the supply system and give no credit. [3]Have the material turned into DRMO.

DODINST 4100.37 provides the framework for the Department of Defense excess disposal policy. NAVSUPINST 4500.13 (still in the draft stage) outlines the latest retention and disposal policy for the Navy. In its current configuration, the instruction allows no disposal of stock items that have been in the Navy Supply System seven years or less. This applies only to repair parts and not to "consumable" items (pens, pencils, paper, notebooks) like those provided by GSA. The supply system will retain parts with an Item Mission Essentiality Code (IMEC) of 3,4 or 5 at a level of 20 years forecasted demand, plus all known retail requirements and prepositioned war reserve requirements.[Ref. 5]*** [Ref. 6]

E. IMPROVED MATERIALS RETURNS (IMR) PROGRAM

Excess material with less than $20.00 extended money value is processed back into the supply system through the Improved Material Returns (IMR) program. ISSOTs at NSC Oakland and at

*** IMECs are formed from the combination of Mission Essentiality codes (MECs) and Mission Criticality Codes (MCCs). MECs denote the importance of a part to the applicable end item. MCCs relate the criticality of the equipment or system to ship or aircraft mission accomplishment. IMECs 3, 4, 5 indicate the following: 3 - a severe degradation of primary mission capability; 4 - loss of primary mission capability; 5 - not mission capable, not safely flyable (aviation only)[Ref. 6, p. 2-40, 2-47]

Portsmouth, VA run the IMR program. All navy activities send their low value excess material to the two ISSOTs. Private contractors provide the manpower for the ISSOTs. Navy personnel supervise the overall operation.

ISSOTs screen, segregate, list and store material in much the same manner as a supply center. They offer excess material back to the supply system on a periodic basis through DAAS in the same manner as the supply center. Each document is routed to the appropriate inventory control point (ICP) and IMM by DAAS.

The IMM responds through DAAS with disposition instructions for the material. Returnable material is picked, packed, and shipped to the appropriate ICP/IMM/stock point based on UMMIPS priority and time frame criteria.

The material from the two ISSOT sites is distributed as per Table II:

TABLE II: Material Distribution from ISSOT Sites

Portsmouth		Oakland	
NSC Norfolk	10%	NSC Oakland	80%
DLA	80%	Other	20%
Other	10%		

[Ref. 7]

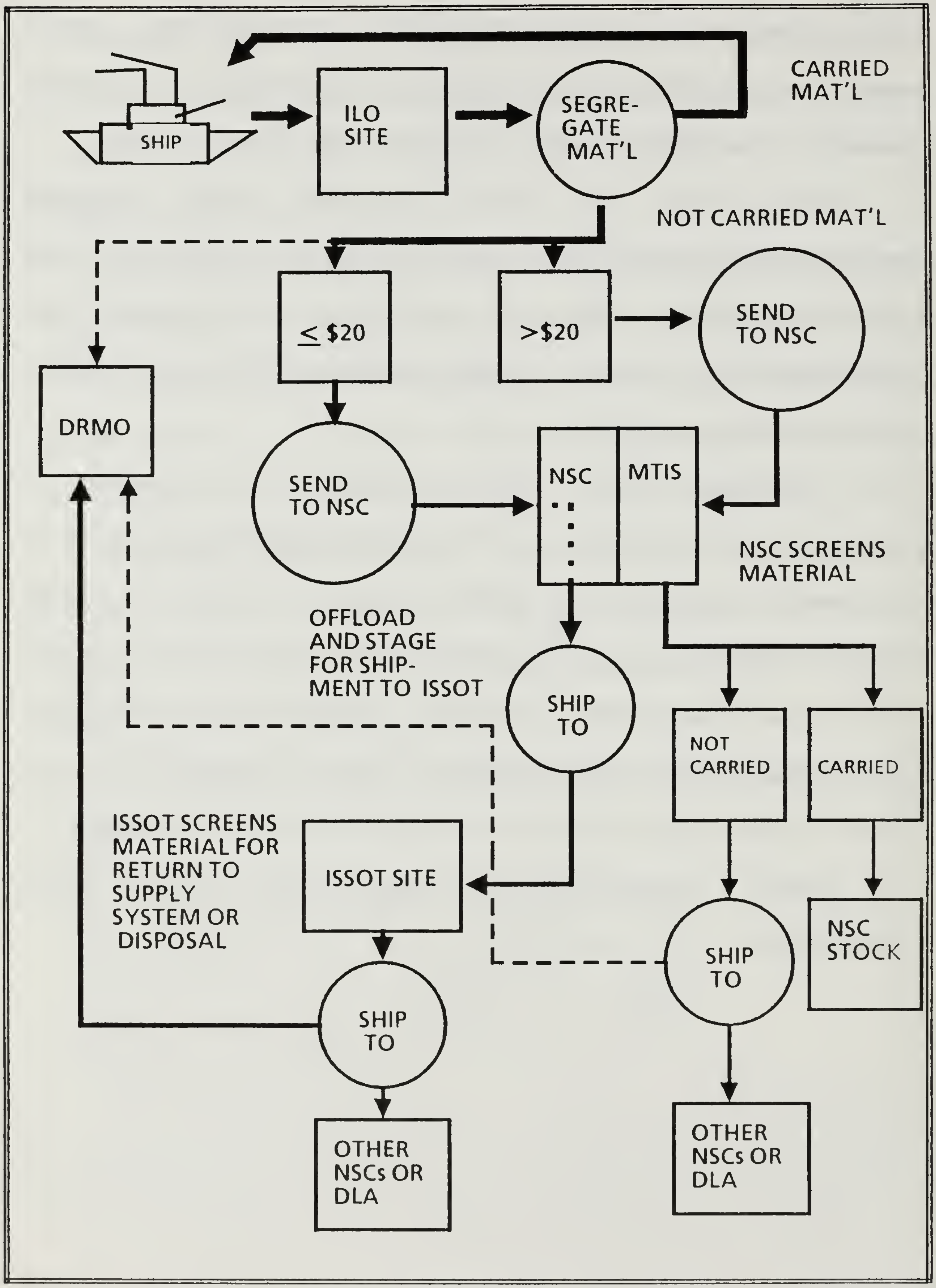
Navy activities may request material from the ISSOT sites. ISSOT may charge a picking and packing fee for processing the material and for transportation costs. Otherwise the material is free.

During fiscal year 1988, the IMR program returned approximately 193,000 line items to the supply system at a value of $1.8 million. The cost to process this material was approximately $1 million, excluding transportation and handling to the processing site.[Ref. 7, p. 2]

Currently, ISSOT Oakland maintains an inventory of approximately 700,000 items.[Ref. 8] ISSOT Portsmouth carries an inventory of approximately 240,000 items.[Ref. 9] Since material is not segregated by stock number, the actual number of line items represented is lower. There are approximately four items for every stock number.[Ref. 9] ISSOT tracks these items on a D-Base III data base loaded on a Zenith 248 personal computer.

Figure 1 traces the flow of material from the ship to the ISSOT site.

FIGURE I: FLOW DIAGRAM OF MOVEMENT OF AT 7 MATERIAL



CHAPTER THREE: COSTS OF THE CURRENT SYSTEM

A. INTRODUCTION

This chapter analyzes specific costs incurred by each part of the system as material flows from the ship to the ISSOT sites at Oakland and Portsmouth. Using the direct costing method, a cost for each part of the system will be estimated and aggregated to derive a total cost. Direct costing suffers somewhat from an accuracy standpoint in that the sum of the parts does not necessarily equal the whole. Inaccuracies tend to compound themselves throughout the estimation. Although direct costing has certain disadvantages, it is difficult to analyze the problem any other way. Additionally, assumptions concerning the flow of material and number of personnel will be made to provide consistency throughout the analysis.

This chapter will be divided into three sections:

- Baseline assumptions regarding the analysis
- Identifying the costs through the system
- Cost Drivers

A cost model will be derived to determine the baseline costs for material moving through the system from the ship to the final

destination point. The primary factors involved in the cost determination are transportation costs from one place to the next, labor costs at each site, and holding costs at each site.

B. BASELINE ASSUMPTIONS

The baseline model is derived from a typical offload of material from a submarine tender going through overhaul at Naval Shipyard Long Beach. Based on Table I, which lists the number of AT code 7 items onboard five different tenders, the average amount of AT Code 7 material offloaded would be approximately 7,600 line items. An estimated 5,000 of those line items will have extended money values of less than $20.00.

The ship is assumed to offload all its storerooms into the ILO warehouses at Long Beach and assign a certain number of sailors to process the material. This is typically four lower grade petty officers supervised by an E-6 from the ILO site.[Ref. 10] The excess material will follow its normal route from Long Beach to San Diego to Oakland.

Military pay rates are derived from the Billet Cost Model of the Chief of Naval Operations.[Ref. 11] The current edition of the model was published in 1984. The hourly rates in the model

were inflated by a Consumer Price Index multiplier to approximate fiscal year 1989 wages.

A linear relationship is assumed between independent variables and all costs. Equal increases in quantity will be reflected by proportional increases in cost. A linear relationship is appropriate for estimating the major portion of ISSOT costs since the civilian contractors who work for the ISSOT are paid per a line item and there is no discount for large volumes. Computing transportation costs is where the linear assumptions tend to be questionable. Transportation costs generally tend to decrease with an increase in volume. However, the transportation costs are the smallest part of the total cost calculation, accounting for approximately one percent of the total cost. Labor costs at ILO sites and at the supply centers around the country are assumed to be approximately the same.

C. IDENTIFYING THE COSTS

The cost categories are identified by three major headings, corresponding to the areas where they were incurred: the ILO sites, the local supply centers and the ISSOTs at Portsmouth and Oakland. Within each of these headings, costs were primarily divided into the following sections:

- Labor costs by either sailors or civilian personnel at each of the sites
- Shipping costs from each of the sites to the next location
- Holding costs for time spent at each location

Most of the costs of processing excess material are incurred at the beginning and the end of the disposal process where the majority of labor intensive work is performed. These costs are the easiest to quantify. The in-transit shipping and handling costs are a little more difficult to quantify which may result in some inaccuracies.

1. Transfer Costs From The Ship To The Local Naval Supply Center

The cost of transferring excess material from the ship to the ILO site is not included as part of the cost estimate. During an overhaul all storeroom spares are offloaded, counted, verified and placed in containers for eventual backloading onto the vessel. Excess that was on the ship comes off with the rest of the material.

During the verification process, stock numbers of all parts from the ship are entered into an ILO computer which matches the items in the warehouse against an updated COSAL or load list.

A new requirements list and an offload list are generated as part of this process. The offload list is kept on a computer tape. It is at this point that the costs of processing the material back into the system will start.

The computer tape is forwarded to NSC San Diego, the closest supply center, for generation of turn-in documents. At the Long Beach ILO the tape is generally handcarried to NSC San Diego by a senior enlisted person, either an E-6 or an E-7.[Ref. 10] A senior person is sent to ensure the timely and safe arrival of this important tape. The cost of handcarrying the tape to NSC San Diego is one day's wages or one man day (eight hours). One day's wages for an E-6 is $12.88/HR * 8 HRS = $103.04. The distance between San Diego and Long Beach is approximately 120 miles. Assuming a government rate of $.24/mile, the transportation costs are $57.60.[Ref. 12] Transportation and wages total $160.64. Dividing the cost by 7600 stock-numbered line items generates a rate of **$.021** cents per item.

Sending a senior enlisted person with a computer tape to the nearest supply center may be an anomaly of Long Beach. An alternative approach would be to send the tape via Federal Express or other rapid delivery organization. Federal Express advertises a

rate of $8.25 for their smallest package that a computer tape can easily fit into. This would reduce the cost to **$.001** per item.

Once the tape is at NSC San Diego, the ADP staff produces picking tickets (turn-in documents) to be attached to the material. The costs to produce a single picking ticket at the ADP operation are approximately **$0.06**.[Ref. 13] Again an enlisted person from the ship is sent to San Diego to pick up the picking tickets. The 7600 picking tickets require several boxes and cannot be forwarded via Federal Express cost effectively. Assuming an E-6 is sent for the picking tickets, the same costs are incurred as previously described so another **$.021** is added to the line item cost.

A group of four junior petty officers/seamen attach the picking tickets to the parts and load them for transportation to NSC San Diego. For simplicity's sake, assume two E-3s and two E-4s compose the group which is supervised full-time by an E-6. Personnel at ILO Long Beach estimate that an individual can process on the average 100 line items a day. Assuming that the supervisor will also contribute toward the process, but at a lower rate, (50% of the average assuming that approximately half his time will be taken up with supervision and administration) a team

of that size could process about 450 line items per day. Based on the adjusted wage rates, the total cost to process the material is displayed in Table III:

Table III: Labor Costs at ILO Site

#	RATE	WAGE	# HRS	TOTAL
ONE	E-6	12.88	8HRS	103.04
TWO	E-4	8.04	8HRS	128.64
TWO	E-3	6.28	8HRS	100.48
TOTAL				332.16
LINE ITEM COST: $332.16/450 = .74				

NSC San Diego requires activities turning in excess parts of less than $20 extended money value to load them into 20" x 20" x 20" boxes.[Ref. 14] Parts that are carried at NSC San Diego are put into separate boxes from parts that are not carried at NSC San Diego.[****] Approximately 250-300 line items can fit into a box.[Ref. 15] These boxes are sent daily to the transportation department of the base a few blocks from the ILO site. Transportation collects the boxes and sends them once a week to San Diego. The cost of sending a truck to San Diego is $220.00.[Ref. 16] Sixteen 20" x 20" x 20" boxes can fit on a

[****] Segregation of parts in this manner appears inefficient when the carried and not carried boxes both go to the ISSOT at Oakland. NSC San Diego requires the separation of the material since the picking tickets were generated according to whether they were carried or not carried at San Diego.

pallet stacked four high. Sixteen pallets can fit on a large tractor-trailer [Ref. 16]. Assuming an average of 275 line items per box, then: 275 line items x 16 boxes x 16 pallets = 70,400 potential line items could fit into a truck. The approximate average price of transportation from Long Beach to San Diego then is **$.003** per line item ($220/70,400). This is assuming that the trucks are utilized to their full capacity which is normally not going to be the case.

One of the factors not considered up to this point is the holding cost of the material at the ILO site. Material from an offload will remain at the ILO site anywhere from 3-5 months.[Ref. 10] Excess material is generally the last material to be processed. The minimum amount of time in storage would therefore be three months. The three month holding period and the standard 23% annual holding cost for inventory in the Navy should be applied to the value of the AT Code 7 inventory.[Ref. 6]

The AT Code 7 material can be valued in two ways: extrinsically or intrinsically. The extrinsic value of the material is its book value as described in the Management List, Navy (ML,N). The averages in Table I were derived from the extrinsic value of the AT Code 7 material, yielding a value of approximately

the AT Code 7 material, yielding a value of approximately $140,000. The intrinsic value of the material can be defined as what the material is actually worth to the Navy. The $140,000 "book" value does not consider how much of the material will eventually be scrapped. For an accurate measurement of processing costs, the intrinsic value of the material should be used instead on its "book" value. Since 75% of the less than $20.00 material is passed to DRMO, the intrinsic value of the material is actually below $140,000.[Ref. 17][Ref. 18]

Figure II is a graphic illustration of the intrinsic valuation of the parts in the system as outlined in this paragraph. The average ML,N value of the AT Code 7 material with extended cost less than $20.00 is approximately $50,000. Twenty-five percent of this material goes back into the supply system ($13,500). The remainder ($37,500) is transferred to DRMO. At DRMO approximately 14% of the material is reutilized by the services for a value of $5,250.[Ref. 19] The rest ($32,250) is sold or scrapped at a rate of 2.8% of the original cost of the material for a value of $903.[Ref. 20] Therefore, the total intrinsic value of the material is $109,653 as outlined in the Table IV:

FIGURE II: FLOW OF FUNDS

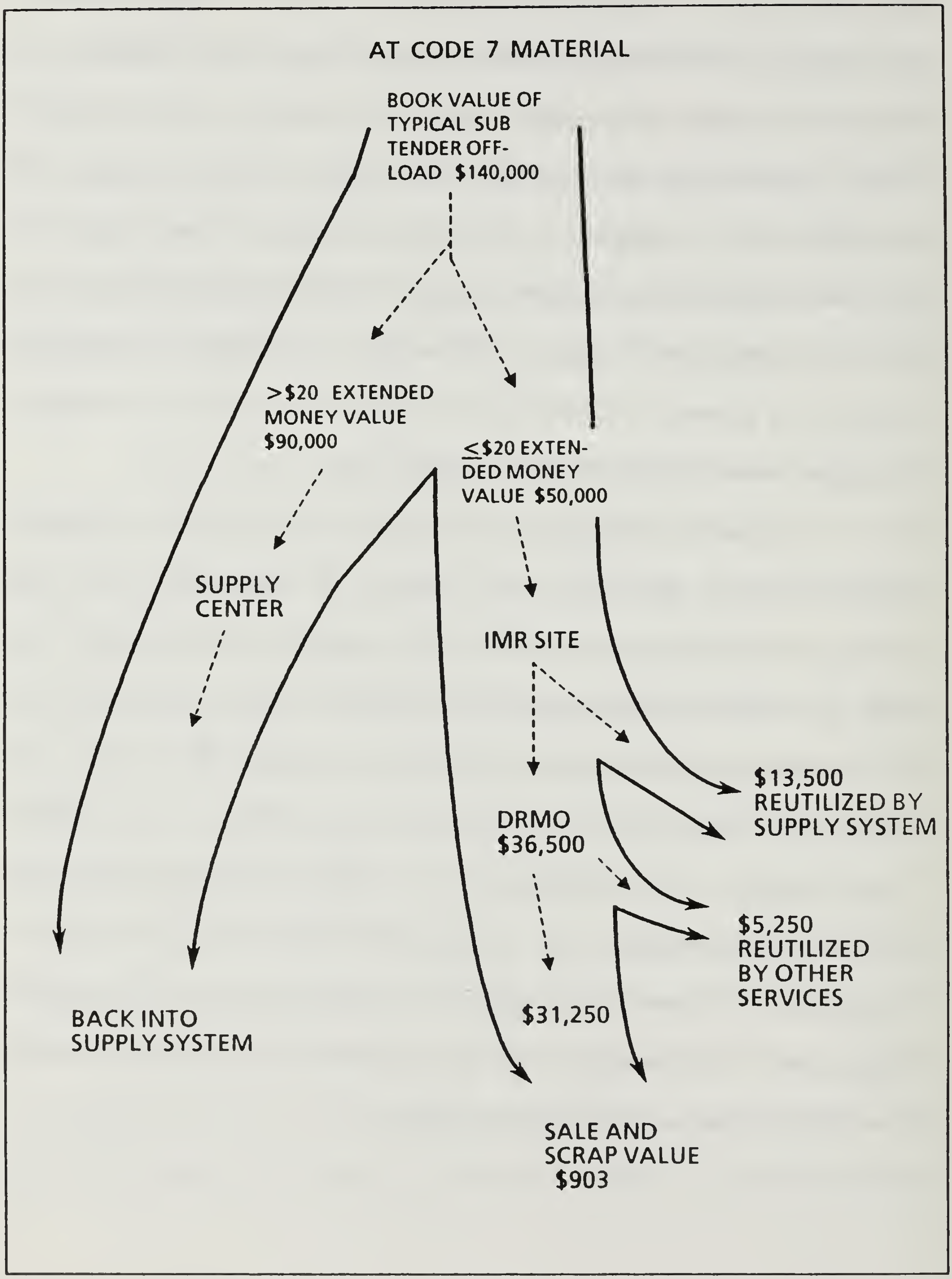


TABLE IV: SUMMARY OF MATERIAL VALUE

CATEGORY OF MATERIAL	COST
>$20 MATERIAL	$ 90,000
≤$20 MATERIAL GOING TO IMM DIR	$ 13,500
14% OF MAT'L REUTILIZED FM DRMO	$ 5,250
SALE AND SCRAP BALANCE	$ 903
TOTAL	$109,653

For purposes of consistency in the analysis, the $109,653 value will be used. When $109,653 is multiplied by the 23% holding cost for three months, the result is $6,305.03 On a per line item basis, the holding cost works out to **$.83** ($6,305/7600).

The total amount to process one AT Code 7 part in this stage of the process is summarized in Table V.

Table V: Summary of ILO costs

Tape Transportation	.042
ADP Costs	.060
Labor	.738
Trans. to San Diego	.003
Holding Costs	.830
Total Cost Per Line	1.673

2. Costs From Local Supply Center to NSC Oakland:

The supply centers act solely as a staging area for the majority of low cost excess material. At NSC San Diego all material less than $20.00 per line item is offloaded from the Long Beach truck and staged for further transportation to the ISSOT site at NSC Oakland. This would account for about 5,000 out of the original 7,600 AT code 7 items offloaded at Long Beach. Material greater than $20.00 per line item is segregated by whether it is carried or not carried at NSC San Diego. Approximately 35-40% of the excess material greater than $20.00 per line item falls into this category and is taken into stock. The turnaround time for material not taken into stock is approximately 30-60 days.[Ref. 21]

There are three costs associated with material at this point: handling, holding, and transportation. The less than $20.00 material requires only minimal handling since it is merely moved from the Long Beach truck and staged until enough material is gathered to fill a truck for transshipment to Oakland. The MTIS supervisor estimated that this process involved only five people for four hours of work with total volume of approximately eight pallets once a month.[Ref. 21] Assuming that the five

people are Logistics Technicians and receiving WG-4 pay, their hourly wages are $10.96.[Ref. 11] Total cost for processing the 8 pallets is:

5 people x 4 hrs x 10.96 = $219.13

If 8 pallets represent approximately 35,200 line items (8 pallets x 16 boxes x 275 parts/box) then the cost per line item is approximately **$.006** ($219.13/35200).

The remainder of the AT code 7 offload represents about 2,600 line items. Forty percent of that material (1040 line items) will stay at NSC San Diego. The cost of processing a receipt is **$3.49** at NSC San Diego.[Ref. 22] The receipt cost multiplied by 1040 gives a total of **$3,630**.

The remaining 60% of the AT code 7 material greater than $20.00 extended money value (1560 items) will have a holding period of approximately 30 days awaiting disposition instructions from the IMM. Roughly calculating from Table I, the average value for all material greater than $20.00 per line item is $90,000. Dividing $90,000 by the initial 2,600 line items with extended money values greater than $20.00 will yield an average line item value of $34.62 ($90,000/2600). Multiplying the 1560 line items not taken into NSC San Diego's stock times the $34.62 unit price

gives an approximate inventory value of $54,000. All of the less than $20.00 material would have a value of approximately $19,653. Therefore, the total value of material awaiting transit would be $73,653 ($54,000 + $19,653). Applying the 23% per year holding cost for one month would yield a value of **$1,412**.

To find a unit cost for all parts processed by NSC San Diego, a weighted average of the processing cost of the material kept at the NSC which is greater than $20 ($3,630) and the processing cost of the material not kept at NSC ($1,412) must be taken. Averaging the total cost of $5,042 over 7,600 parts yields a per item cost of **$.663** ($5042/7600).

Shipping costs from NSC San Diego to NSC Oakland are based on weight. The lowest cost is for a triwall container weighing from 50-100 pounds ($26.00).[Ref. 23] Since most AT code 7 material is small in size, and based on similar volumes of the containers, the amount of material fitting into a triwall would be approximately the same as the amount fitting on a pallet (16 [20x20x20] boxes x 275 parts = 4400 line items), the lowest cost triwall would probably be appropriate. The 5000 less-than-$20.00 parts would use 2 triwalls at $26.00/triwall for a total of $52.00 or **$.006** per line item. The greater-than-$20.00 material is

shipped to many different places and estimating the shipping costs is impossible.

In summary, the total costs at the supply center for moving and processing the hypothetical AT code 7 offload is:

Table VI: Summary of NSC costs for processing all AT code 7 mat'l

Handling-Mat'l<$20	.006
Trans. to Oakland	.006
Weighted Average of all mat'l processed	.663
Total Cost Per Line	.675

3. Costs at the ISSOT Sites:

Costs at the ISSOT sites are relatively simple to quantify. The Navy pays the contractor a per line item charge for processing material. These charges are broken down as follows:

Table VII: IMR Program Costs

	Portsmouth	Oakland
Receipt, Stow & Data Entry	.500	.990
Pick, Pack, Mat'l handling for shipment	.820	1.290
Overhead-26% Ports/11.7% Oak	.343	.267
Total line item cost	1.663	2.547

[Ref. 7]

Based on the year-end monthly status reports for both Portsmouth and Oakland, the administrative overhead rates for each are 26% and 11.7% respectively.[Ref. 24][Ref. 25] Applying

the applicable overhead rates to the Oakland and the Portsmouth ISSOTs would yield a total of **$2.55** for Oakland and **$1.66** for Portsmouth per item.

Not accounted for in the overhead calculations are the holding costs for the material and the opportunity cost of ISSOT use of government facilities. The standard Navy 23% holding cost rate includes a warehousing cost (1%), so the opportunity cost of using the facility can be excluded. The holding cost at each of the facilities can be calculated by taking an average of the processing time and multiplying it by the Navy's holding cost rate. The average holding time at Portsmouth is 45 days or 1.5 months.[Ref. 7] Oakland's holding time is 105 days or 3.5 months.[Ref. 26] Given the inventory value of $19,653 for the less-than-$20 material calculated on page 29, the holding cost is approximately **$.0753** per month per item ($19,653/5000 * .23/12). This translates into a holding cost of **$.113**/item (1.5 mos. x $.0753/month) for Portsmouth and **$.264**/item (3.5 mos. x $.08/month) for Oakland.

The above costs represent the minimum holding costs. ISSOT Oakland has a very substantial inventory (700,000 items) which is growing.[Ref. 26] Since the ISSOTs are not supposed to be mini-supply centers, the majority of the material in inventory

can be considered backlog. Assuming the processing rate at the IMR site is the same as the ILO site since the type of material and difficulty levels of processing are similar, it would take 32 months to reduce the Oakland inventory level down to zero (ten people working continuously). It would take at least 27 months to reduce the current level at the Oakland IMR site to approximately 100,000 items. A 27 month holding cost per line item would raise the total holding cost to **$2.16** per line item.

To fully complete the cost determination of the present system, the cost of shipping from the ISSOT sites to the final destinations would also have to be added in. An estimation of the transportation costs would be very difficult since the final destinations vary considerably. On the west coast, 80% of the parts go eventually to NSC Oakland.[Ref. 7] Transportation costs to move the material from the ISSOT warehouses to the NSC Oakland warehouses would be minimal. On the east coast, only 10% of the material goes to NSC Norfolk and 80% goes to the Defense Logistics Agency (DLA).[Ref. 9]

In summary the total IMR Program Costs are:

Table VIII: Total IMR Costs

	Portsmouth	Oakland
Contract Costs	1.663	2.547
Holding Costs	.113	.264
Total line item cost	1.776	2.810

Table IX summarizes the costs from the different stages the material must pass through. The total aggregate cost for the east coast is $4.12/item and for the west coast is $5.15/item.

D. COST DRIVERS

There are several cost drivers that must be accounted for in calculating the costs of running the system as it is currently configured. The most obvious cost driver in this example is the location of the offloading activity. While the Long Beach ILO is one of the largest ILO sites on the west coast, it is not the only one. There are sites at San Diego, Mare Island and Bremerton and several on the east coast. ILO sites near Norfolk and Oakland send their material directly to the ISSOTs, avoiding the added cost of shipping through the local supply center.[Ref. 27] Doing this would result in a savings of approximately $.74 per line item.

TABLE IX: TOTAL COST BASELINE

ILO COSTS	PORTS MOUTH	OAKLAND	VARIABLES			
			TRANS	# LINES	# TRIPS	
TRANSPORTATION	0.042	0.042	160.64	7600	2	
ADP	0.060	0.060				
			E-3 LBR	E-4 LBR	E-6 LBR	#PTS/DAY
LABOR	0.738	0.738	100.48	128.64	103.04	450
			TRUCK COST	#LINE PER BOX	# BOXES/ PALLET	# PALLETS PER TRUCK
SHIPPING	0.003	0.003	220	275	16	16
			COST OF INV	HOLDING COST	# PARTS	# MONTHS
HOLDING	0.830	0.830	109653	0.230	7600	3
TOTAL	1.673	1.673				
NSC COSTS						
			# PERS	HOURS	WAGE	
HANDLING (MAT'L <$20)	0.006	0.006	5	4.000	10.96	
			VAL>$20	VAL<$20	HOLD COST	# PRTS
HOLDING (MAT'L <$20 & >$20 NOT RECVD BY S.D.)	0.215	0.215	54000	19653	0.23	6560
SUBTOTAL	0.221	0.221				
			MTIS COST	#PTS>$20		
REC. COSTS (>$20 KEPT AT NSC)	3.490	3.490	3.49	1040		
TOTAL WEIGHTED AVG OF <$20 & >$20	0.669	0.669				
			SHIP COST	# LINES/PAL		
SHIPPING	0.006	0.006	26.00	4400		
TOTAL	0.675	0.675				
ISSOT COSTS	PORTS	OAKLAND	PORTS	OAK	PORTS-OH	OAK-OH
CONTRACT COSTS	1.666	2.547	1.32	2.28	0.26	0.117
			DYS HLD	DYS HLD	HLD COST	INV VALUE
HOLDING	0.113	0.264	45	105	0.23	19653
TOTAL	1.779	2.810				
GRAND TOTAL	4.121	5.152				

ILO sites are not the only sources of low cost excess material. Shipyards, Naval Supply Centers and other shore establishments also provide material to the ISSOTs. Such shore establishments employ civilians to handle most of the supply functions. Civilians are generally paid more than their military counterparts. Their handling of the same kinds of tasks as the sailors perform at the ILO sites would undoubtedly raise the costs of the work performed. The ILO labor costs are a minimum figure which is more likely to move up than down.

The largest single component in the total cost calculation is the line item cost outlined in the ISSOT contracts. These costs represent approximately 50% of the total for the west coast and about 41% of the total for the east coast. These are also the most concrete costs available in the entire analysis, since they are contractually stipulated.

There are major price variances between the two ISSOT sites. It is approximately $1.03 per item cheaper to process material on the east coast than on the west coast. Depending upon the transportation costs, more material should be processed by the Portsmouth site than by the Oakland site.

1. Sensitivity Analysis

A sensitivity analysis was conducted to examine changes in the following variables:

- Number of line items
- Holding costs - value of the inventory
- Holding time

Table X summarizes the effect of changes in the values of these variables.*

The largest uncertainties occur with the number of line items moved and the cost of those line items. Number of parts and cost are the primary factors in calculating transportation costs per unit and holding cost per unit.

a. Number of Line Items

The number of line items offloaded during a ship's visit to an ILO site is derived somewhat simply by averaging the AT Code 7 items from the sample of five submarine tenders. This number, if anything, errs on the conservative side. The larger the number of parts, the lower the cost per line item when an item is being transported. Tables XI and XII represent approximately one

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* For individual spreadsheets see Appendix A

TABLE X: A COMPARISON OF THE BASELINE AGAINST VARYING INPUTS

ILO COSTS	BASELINE COSTS PORTS	BASELINE COSTS OAKLAND	CHANGE # OF PARTS FM 7600 TO 5600 PORTS	CHANGE # OF PARTS FM 7600 TO 5600 OAKLAND	CHANGE # PARTS FM 7600 TO 9600 PORTS	CHANGE # PARTS FM 7600 TO 9600 OAKLAND	CHANGES PARTS PER BOX FM 275 TO 400 PORTS	CHANGES PARTS PER BOX FM 275 TO 400 OAKLAND	COMBINED CHANGES: 9600 TOTAL PARTS & 400/BOX PORTS	COMBINED CHANGES: 9600 TOTAL PARTS & 400/BOX OAKLAND
TRANSPORTATION	0.042	0.042	0.057	0.057	0.033	0.033	0.042	0.042	0.042	0.042
ADP	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060	0.060
LABOR	0.738	0.738	0.738	0.738	0.738	0.738	0.738	0.738	0.738	0.738
SHIPPING	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
HOLDING	0.830	0.830	1.126	1.126	0.657	0.657	0.830	0.830	0.657	0.657
TOTAL	1.673	1.673	1.985	1.985	1.492	1.492	1.672	1.672	1.499	1.499
NSC COSTS										
HANDLING (MAT'L (\$20)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
HOLDING (MAT'L (\$20 &)\$20 NOT RECVD BY S.D.)	0.215	0.215	0.295	0.295	0.170	0.170	0.215	0.215	0.170	0.170
SUBTOTAL	0.221	0.221	0.301	0.301	0.177	0.177	0.221	0.221	0.177	0.177
REC. COSTS ()\$20 KEPT AT NSC)	3.490	3.490	3.490	3.490	3.490	3.490	3.490	3.490	3.490	3.490
TOTAL WEIGHTED AVG OF (\$20 &)\$20	0.669	0.669	0.741	0.741	0.630	0.630	0.669	0.669	0.630	0.630
SHIPPING	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
TOTAL	0.675	0.675	0.747	0.747	0.636	0.636	0.675	0.675	0.636	0.636
ISSOT CONTRACT COSTS	1.666	2.547	1.666	2.547	1.666	2.547	1.666	2.547	1.666	2.547
HOLDING	0.113	0.264	0.113	0.264	0.113	0.264	0.113	0.264	0.113	0.264
TOTAL	1.779	2.810	1.779	2.810	1.779	2.810	1.779	2.810	1.779	2.810
GRAND TOTAL	4.121	5.152	4.504	5.536	3.900	4.932	4.120	5.151	3.908	4.940
CHANGE FROM THE BASELINE IN PERCENT			1.09	1.07	0.95	0.96	1.00	1.00	0.95	0.96

TABLE XI: SAMPLE OF TURN-INS TO MTIS DEPARTMENT AT NSC SAN DIEGO

ACTIVITY	TOTAL EXCESS	< $20.00	% OF < $20.00
USS ELLIOT	8790	4995	56.8%
USS GEORGE PHILLIPS	2768	1436	51.9%
NAVTRAIN SYSCOM	4079	2932	71.9%
USS THACH	8201	5405	65.9%
USS NEW ORLEANS	704	20	2.8%
USS LONG BEACH	1964	911	46.4%
USS HENRY B. WILSON	5672	4077	71.9%
USS ALAMO	1684	1209	71.8%
USS HORNE	18150	11156	61.5%
SIMA SAN DIEGO	1753	710	40.5%
USS TUSCALOOSA	4688	3442	73.4%
NAVSTA S.D.	2197	43	2.0%
USS LONG BEACH	11861	7215	60.8%
TOTAL	72511	43551	60.1%

TABLE XII: SAMPLE OF TURN-INS TO ILO ORGANIZATION AT LONG BEACH NAVAL SHIPYARD

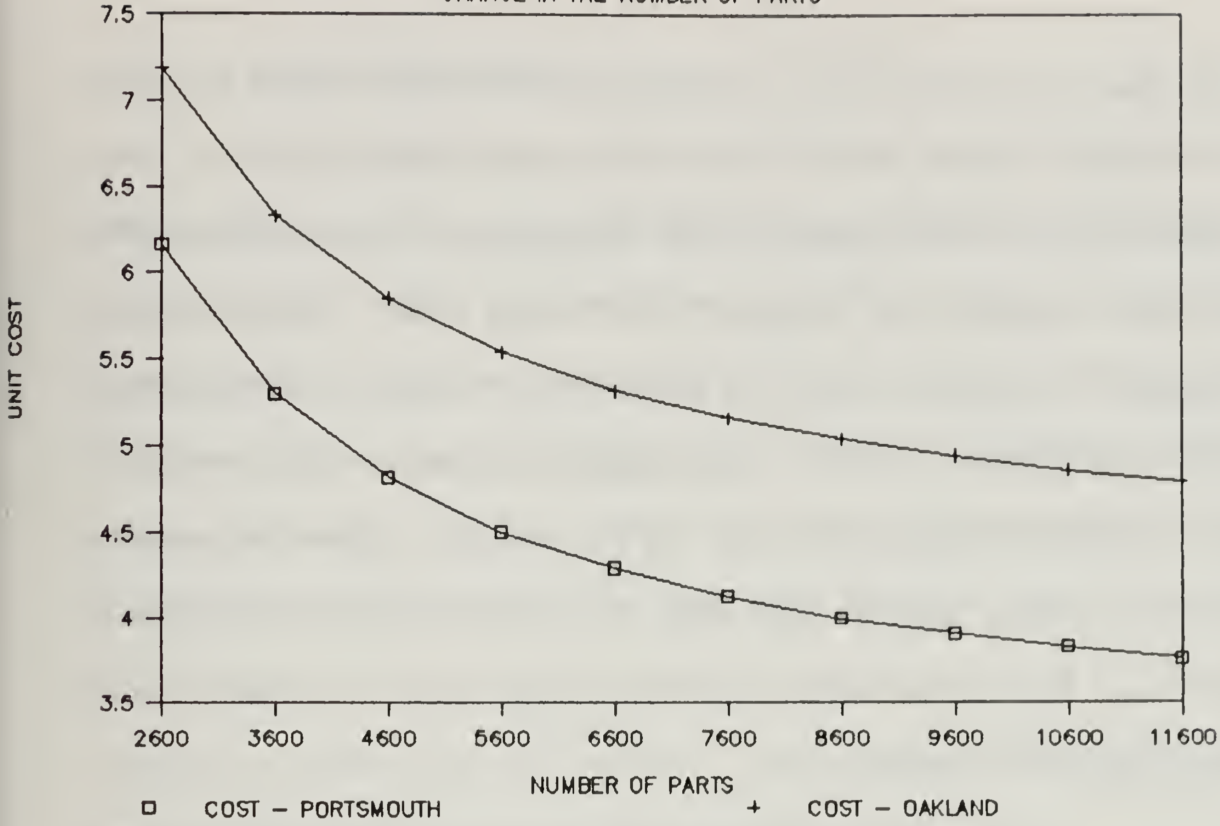
ACTIVITY	TOTAL EXCESS	< $20.00	% OF < $20.00
USS OGDEN	2331	6	0.3%
USS CROMELLIN	10988	7501	68.3%
USS TARAWA	21008	6503	31.0%
USS FLETCHER	5672	4077	71.9%
USS LEWIS B. PULLER	1684	1209	71.8%
USS JOUETT	18088	11313	62.5%
USS JOHN A. MOORE	1670	74	4.4%
USS GEORGE PHILIP	4787	2835	59.2%
USS PULLER	4539	2445	53.9%
TOTAL	70767	35963	50.8%

year's worth of material turn-in data from the ILO site at Long Beach and the MTIS department at NSC San Diego. The average at the ILO site for all material is 7,863, including material of over $100 extended money value. The average at NSC San Diego is 5,578, also including the material over $100. Actual amounts of AT Code 7 material would probably be less than the 7,600 line items assumed in the analysis.

Virtually all unit costs at the ILO site and the supply center are dependent on the number of parts. Table X shows that lowering the number of line items from 7,600 to 5,600 (26.3%), results in an increase of approximately 8% in cost ($.38). Table X also indicates that an increase in the number of lines items from 7,600 to 9,600 (26.3%) results in a smaller decrease in cost; approximately 4.5% ($.22). Figure III, which graphs the change in number of parts versus change in unit cost, confirms that the cost is more sensitive to a decrease in the number of parts than to an increase in the number of parts.

Closely related to the number of total line items are the shipping costs. Shipping costs are primarily affected by the number of units that fit into a container. The ILO site ships low dollar excess in boxes that are 20" x 20" x 20". The number of

FIGURE III: CHANGE IN UNIT COST VERSUS
CHANGE IN THE NUMBER OF PARTS



NUMBER OF PARTS	PORTS COST	OAKLAND COST
2600	6.16	7.19
3600	5.30	6.33
4600	4.82	5.85
5600	4.50	5.54
6600	4.29	5.32
7600	4.13	5.16
8600	4.00	5.04
9600	3.91	4.94
10600	3.83	4.86
11600	3.76	4.79

arts that can fit in such a container is variable. Since AT code 7 material tends to be small, ILO personnel estimated that approximately 250-300 line items could fit into such a box. For the cost estimate, an average of 275 was used. Based on the capacity of a truck to hold 16 pallets of 16 boxes of 275 parts, a price of $.003 was derived. Increasing the number of parts to 400 per box had virtually no effect on the result. Since the amount per line item is already less than $.01, the number of line items per box has little effect on the total cost. This is also demonstrated in Table X.

Shipment costs from NSC San Diego are also based on number of line items per triwall. 4,400 line items were estimated to fit into a triwall and that figure was divided into the cost of shipping one triwall to Oakland (at the cheapest rate). The resultant amount of $.006 will be little affected by an increase in the number of line items per triwall.

Changes in the number of line items have a marginal effect on the unit cost of transporting the ADP tape back and forth from the ILO site to the supply center. A 2,000 part increase or decrease lowers and raises the cost by less than $.02.

b. *Holding Costs*

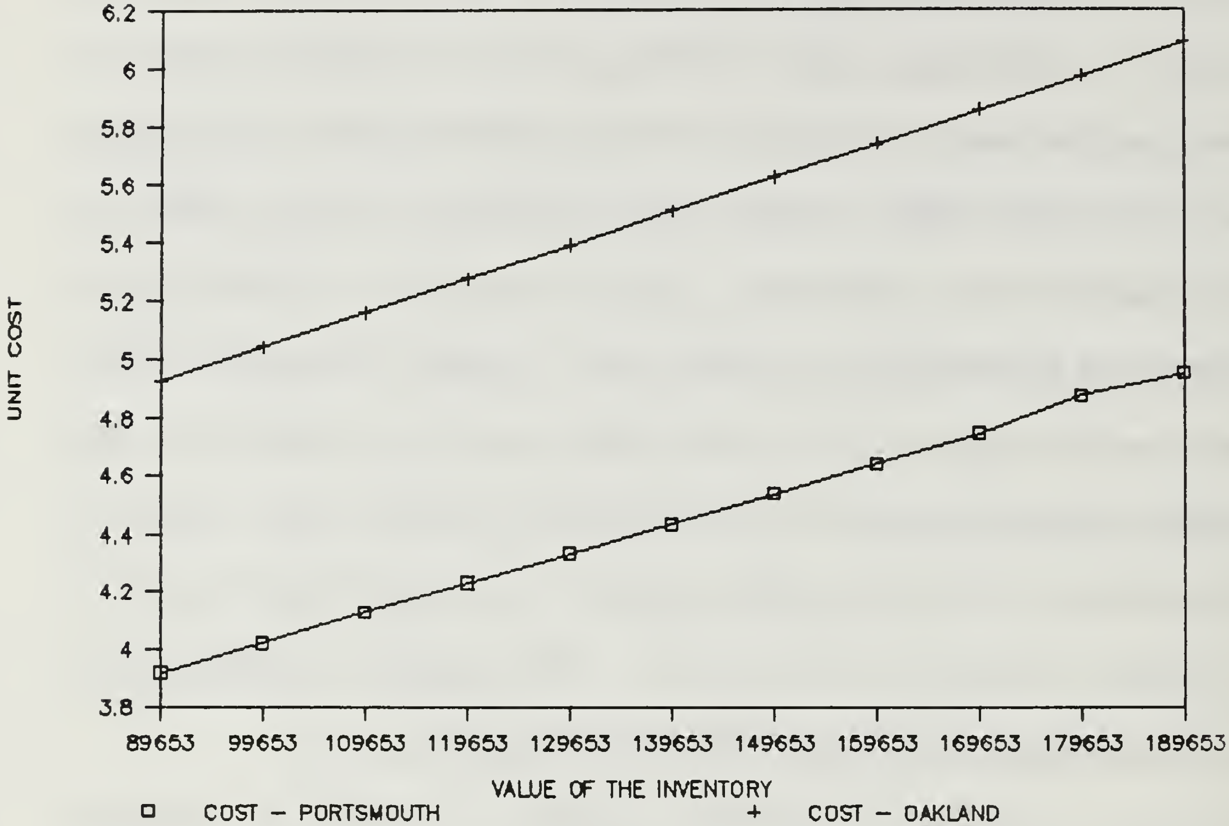
Holding cost is perhaps the most contentious item in the analysis since it accounts for the largest fraction of the total cost after the ISSOT contract costs. Holding costs are based on the value of the inventory. The value of the inventory was estimated by averaging the data from the five submarine tenders and subtracting out the excess that was not reutilized by the supply system to arrive at an estimated intrinsic value. As seen from Table I there is a wide variance in the value of AT code 7 inventory among the five tenders. This variance would be even more pronounced between different ship types.

Figure IV presents a graph of changes in inventory value versus changes in unit cost in $10,000 increments. The curve indicates a constant change in unit cost. A $20,000 (18%) change on either side of the estimated $109,653 value yields a $.21 (5%) change in unit cost in either direction.

c. *Holding Time*

A related variable to holding cost is holding time. Holding cost is a function of holding time. By varying the holding time at the various locations which are responsible for processing At Code 7 material, holding costs will increase or decrease. The

FIGURE IV: CHANGE IN UNIT COST VERSUS
CHANGE IN THE VALUE OF THE INVENTORY



INVENTORY VALUE	PORTS COST	OAKLAND COST
89653	3.921	4.925
99653	4.024	5.042
109653	4.127	5.158
119653	4.230	5.275
129653	4.332	5.391
139653	4.435	5.508
149653	4.538	5.625
159653	4.641	5.741
169653	4.744	5.858
179653	4.874	5.975
189653	4.950	6.091

total affect of holding time changes is diluted through the holding cost percentage (23%). A change of 33% in the amount of time required to process a part yields only a small percentage change in the unit cost, approximately two to four percent. Figure V is a graphic example of the change in unit cost versus the change in holding time at the ILO site. Appendix B further illustrates the change in cost versus the change in holding time at the various activities processing AT Code 7 material.

d. Labor Costs

Labor costs at the beginning and the end of the turn-in process comprise most of the expenses involved in moving AT code 7 material. These costs however, are the easiest to quantify and are a function of the number of manhours used. The labor at the ILO site is determined by the wages of the sailors involved in the offloading and segregating of material. While the mix of sailors may vary somewhat between paygrades, it is unlikely that the unit cost will increase or decrease with any significance. The labor costs at the ISSOT sites are fixed by contract and the unit cost will not vary at all.

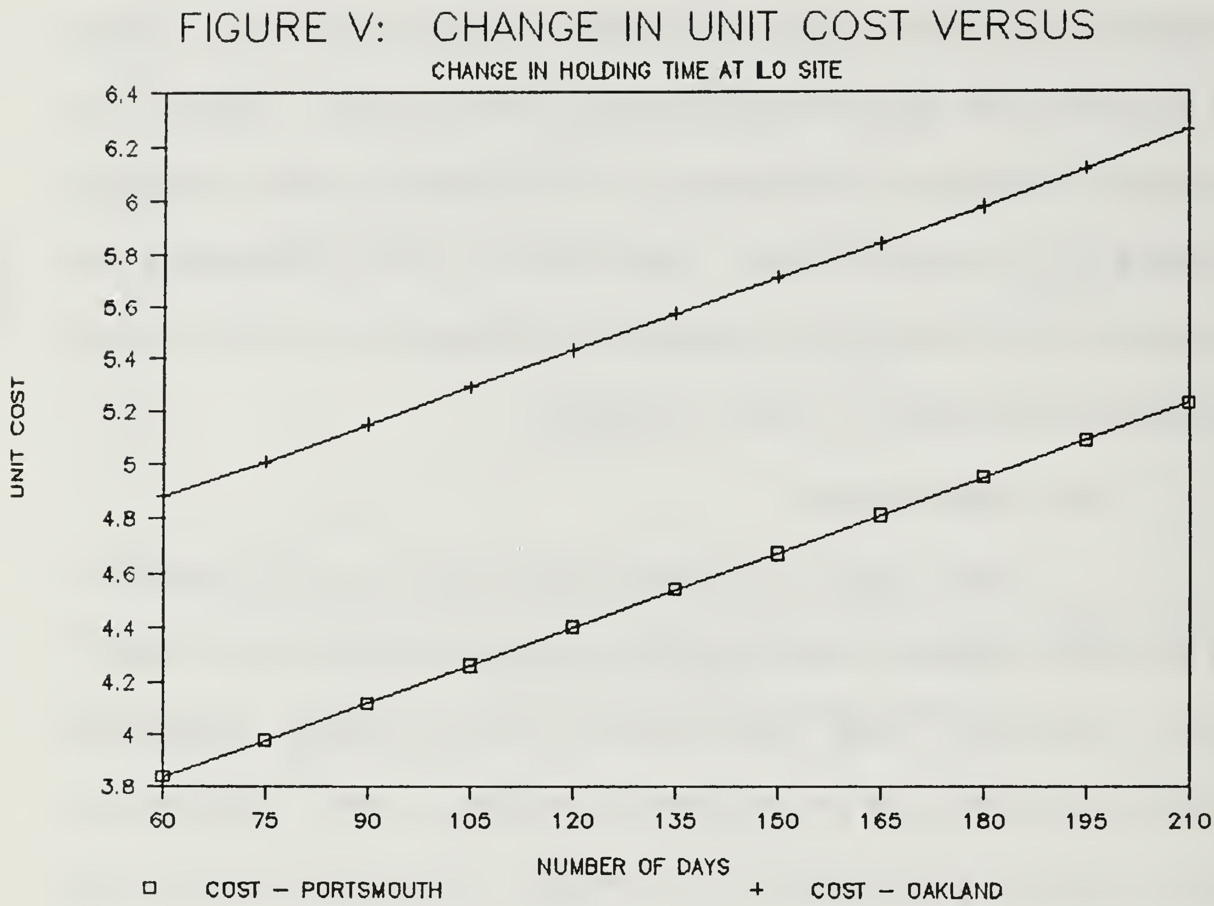


FIGURE V: CHANGE IN UNIT COST VERSUS
CHANGE IN HOLDING TIME AT LO SITE
UNIT COST
6.4
6.2
6
5.8
5.6
5.4
5.2
5
4.8
4.6
4.4
4.2
4
3.8
60
75
90
105
120
135
150
165
180
195
210
NUMBER OF DAYS
COST – PORTSMOUTH
COST – OAKLAND

e. Conclusions

The holding cost portion of the total cost is the most sensitive to changes of the variables examined with the greatest uncertainty. However, it is only marginally more sensitive than a change in the number of line items, by perhaps a percentage point or two. The effect of holding cost on the total cost of the disposal system underscores the importance of an accurate valuation of the cost of the excess material. An accurate valuation was determined in this thesis through an intrinsic derivation of the value of the excess material. Additionally, the accuracy of the line item count plays a significant role in the cost estimation. While a simple average was used in this thesis, a larger sampling of SUADPS 207 ships would allow a more precise estimation. Holding time shows little sensitivity.

The contract labor costs at the ISSOT are the largest cost drivers in the analysis accounting for 32% of the cost at Portsmouth and 44% of the cost at Oakland. These are the areas where the greatest cost savings can occur. Any reductions in the use of contract labor costs will lower total system cost. Close attention to future contract costs will be required to minimize increases in this area.

CHAPTER FOUR: EXPLORING THE ALTERNATIVES

This chapter will analyze the cost effectiveness of the current system and introduce some possible cost-saving alternatives. Although the Navy is not a profit-oriented organization, Navy policies in regard to inventory management should be backed by solid, economic, rational behavior. Programs should be able to "pay" for themselves or at least be self-sufficient through whatever criteria are used to measure payment.

A. THE STATUS QUO

The Improved Material Returns (IMR) program is an example of a program that pays for itself. In fiscal year 1989 the IMR program returned approximately $1.8 million worth of parts to the supply system. The processing cost for that material was about $1.0 million, providing a "profit" of $800,000.[Ref. 7] Such a 44% return on revenues would be the envy of most, if not all, the companies of the Standard and Poor's 500 whose return on equity is generally much lower. And regulated industries in the U.S. averaged only a 10-14% return on equity over the last 20 years.[Ref. 28]

The "profit" above is calculated by totaling all of the credits received from the item inventory managers (through FTR - TA responses received which give credit for turned in material) and subtracting out the costs incurred by the ISSOT sites. For fiscal year 1989, Oakland's credits totalled $147,005.34. However, Oakland periodically ships material to end-users such as shipyards and other activities requiring parts that may not be available from normal channels or that can be procured less expensively through Oakland.[Ref. 17] While NAVSUP receives no financial credit for this material, it represents savings to the Navy in the form of cost avoidance for the type commander or final customer. These amounts should be included in the total credit calculation.

Oakland does not keep track of the costs of the material it sends to other commands.[Ref. 29] Yet, in terms of the number of line items, the amount sent to end-users exceeds the amount turned into the IMM for credit (24,015 versus 20,202).[Ref. 24] To make a rough estimate of how much this material is worth, the number of parts turned over to end-users can be multiplied by the average price of material Oakland turned back into the system. This yields a value of $174,829.20 (147,005.34/20,202 x 24,015).[Ref. 17] Therefore, a rough estimate of Oakland's total

"revenues" is $321,834.54 while their costs for the year are $350,082.36 giving them a loss of $28,247.82 for the year.[Ref. 24] Since this figure is based on rough estimates, it is subject to some variability.

Portsmouth is finishing fiscal year 1989 with a $177,779.52 "profit" on costs of $333,271.[Ref. 25] Portsmouth supplies a much lower volume of parts to end-users (636) than Oakland which costs Portsmouth $10 each to process according to their estimates.[Ref. 30] In order to be consistent, the same unit price will be applied to Portsmouth as to Oakland ($7.28 - average price of material Oakland turned back into the system) which will provide an additional $4,630.08 of revenue to Portsmouth.

Total combined costs for the two ISSOT sites in fiscal year 1989 are $683,353.36. Their estimated combined "revenues" are $837,515.14 yielding a "profit" of $154,161.78 and a return on revenues of 18.4%. Although clearly not as high as fiscal year 1988's return, this amount represents a significant "profit" on investment for the supply system.

Such glowing reports are positive indications for the IMR program. However, the IMR figures do not include transportation costs to and from the IMR sites.[Ref. 7] Since the costs of the

system do not begin and end at the IMR sites, it is appropriate to include both the transportation and handling costs to and from the IMR sites.

In chapter two a unit cost per item was developed to aid in estimating the true total system cost. For AT Code 7 items that are less than $20 extended money value, this cost is $4.12 or $5.15 depending on which ISSOT is handling the material. Taking the actual cost data from Portsmouth and Oakland as a baseline, the additional costs required to get the material to the sites can be quantified relatively easily. Using the number of items stowed at the IMR sites as their amount of inflow, the cost to get the material to the IMR sites are the ILO and supply center costs times the number of stows at the IMR sites. Based on the estimates in chapter three, this amounts to $2.35 per item. Total system costs (not including cost of sending material out from the ISSOTs) are presented laid out in Table XIII:

TABLE XIII: SYSTEM COSTS FOR FY 89

IMR SITES	FY89 Costs	Items Stowed in FY89	Total
PORTSMOUTH	$333,271.00	176,373 X $2.35	$ 747,747.55
OAKLAND	$350,082.36	195,920 X $2.35	$ 810,494.36
		Total Costs	$1,558,241.90
		Total Revenues	$ 832,885.06
		Profit (Loss)	($725,356.84)

As seen in Table XIII when the costs of getting material to the IMR sites are added to the costs actually incurred at the sites, the system lost money in fiscal year 1989. Furthermore, this calculation does not include the cost of sending material out from the IMR sites.

The costs to transport material from the ship to the IMR site ($2.35) in table XIII are derived in chapter three and are open to the same criticisms. Different ILO sites, supply centers, and number of line items will all have an effect on the unit cost. However, the same observations in chapter three hold true in chapter four also. There is a higher probability of the unit cost rising than falling since the costs in chapter three are based on the complete and efficient use of all resources. The unit costs represent a conservative estimate of the total system unit costs.

In summary, at first glance, the IMR concept appears to pay for itself in its current configuration. The return on the funds invested seems high. However, the IMR program does not factor in costs associated with getting material to the site and the costs associated with shipping the material to the next customer. When just the cost of moving material to the site is taken into account, the program does not pay for itself but actually costs more to

operate from a system-wide perspective than the revenues it generates.

B. IMPROVING THE STATUS QUO

Given the conclusion above, should the IMR program be eliminated? Not necessarily. The IMR program can be improved to become more cost effective. Like any profit making organization, the IMR program must accomplish one (or both) of two actions: Reduce costs throughout the system (most of which it can't control) and/or increase "revenues" (revenues being the amount of credit for NAVSUP the program generates or the cost avoidances by supplying material to TYCOMs or other users). The next two sections will introduce how this can be achieved.

1. Reducing Costs

The supply system is a large production process. However, unlike most production processes, the supply system does not take raw material and improve its value through different production stages. Any time an item is moved, stored, issued, and scrapped, investment costs are added to the parts in terms of manhours, transportation costs and material costs. By improving the flow of material through the system, cost reductions can be accomplished.

Improvement of material flow to eliminate wasteful practices can also be applied to the process for putting low dollar value excess back into the system. According to FOSSAC, the IMM forwards 68% of the items coming into the ISSOT sites to disposal at DRMO.[Ref. 31] At the Portsmouth ISSOT site, the cumulative IMR Credit Report for August showed a rate of 82% disposal to DRMO.[Ref. 32] The rate increased in September to 83%. The combined rate for both ISSOTs is 75%.[Ref. 17][Ref. 18] Sending parts to disposal at this point is the same as performing a quality inspection at the end of a production process. Parts are going through the elaborate turn-in system, having investment costs added at each step in the process, and then end up being disposed of at the nearest DRMO at the end of the process. Rationally, it would make more sense to query the IMM at the beginning of the process and segregate out the material that is destined for disposal. Material for which valid requirements still exist could be forwarded on to the ISSOT site. Other material would go directly to the nearest DRMO. This would have two beneficial effects:

1. Investment costs would be saved on all the material that is not forwarded to an ISSOT site and would reduce system

costs by 43% or $673,490. This is calculated by taking 75% of the receipts (stows) at the IMR sites (that would now go directly to DRMO) and multiplying that figure by the unit savings throughout the system. The resulting transportation and handling savings are fairly small while most of the ILO site costs will still be incurred. Small amounts of savings would be received at the supply center. However, the largest savings would be accrued from the reduction in IMR processing costs. The savings are outlined in the table below:

Table XIV: Savings from turning material directly into DRMO from the ILO Site

AREA OF SAVINGS	PORTSMOUTH	OAKLAND
SHIPPING COSTS FM SUPPLY CENTER	.01	.01
HOLDING COST AT SUPPLY CENTER	.08	.08
PROCESSING COSTS AT THE IMR SITES	1.78	2.81
TOTAL UNIT SAVINGS	1.87	2.90
75% OF ITEMS STOWED	132,280	146,940
TOTAL UNIT SAVINGS X ITEMS STOWED	$247,364	$426,126
TOTAL SAVINGS	$673,490	

2. The requirements for personnel at the ISSOT site itself would be reduced.

The ILO sites are already cataloging excess material onto a computer tape. Instead of sending the tape to the nearest supply center, the ILO could query the IMM directly for disposition

instructions on the less than $20 extended money value material and forward the undesired excess directly to the nearest DRMO. Any material without immediate disposition instructions and all the useful excess could then be forwarded directly to the ISSOT site. The ILO site would probably require some additional capability to query the item managers via DAAS, but the investment would be fairly small. Segregation of material for shipment to the DRMO would also require minimal additional manpower. Naval Supply Centers turning in low value excess already have the capacity to query the IMM and could perform the same functions as outlined in the preceding paragraph.

Another possible improvement to the process in combination with the above suggestions would be to load material into containers that would go directly onto the shelf at the IMR site without any additional handling. The ISSOT could standardize all the containers that material would be loaded into. All ILO sites and supply centers would put low dollar excess material in the standard container, record the contents through bar-coding and then assign a bar-code identification number to the box. The contents of all bar-coded boxes could be loaded onto a floppy disk which could be downloaded to the computers at the ISSOT site.

The only handling at the ISSOT site would be to put the box in a location and record the location. Although hard to quantify exactly, a significant labor savings should accrue from material not having to be pulled and identified at the ISSOT site.

2. Increasing "Revenues"

There are two ways to raise revenue: increase the number of credits received from the IMM and expand the number of parts issued to other activities.

Increasing the number of credits from the item manager is very unlikely. Item manager requirements are driven by system needs. Even if the ISSOT offered discounts or more favorable trade arrangements, the item managers would not take much more of their material. However, more queries for credit could be processed to raise the amount of credit responses. Oakland, in particular, has a low rate of querying the IMM, accounting for 44% of the number of items stowed in fiscal year 1989 and only 22% of the amount that the Portsmouth ISSOT sends out queries for(85,600 versus 383,400).[Ref. 25][Ref. 18] Portsmouth made 2.17 times more queries than the number of parts it stowed in fiscal year 1989. Part of Oakland's low query rate is due to the late winter arrival of software that significantly enhanced their

ability to generate IMM queries.[Ref. 33] However, Oakland still appears to be lagging in the number of queries made to the IMM and should be increasing its query output to generate more credits.

Providing more parts to other activities seems to offer the most promise as an area of "revenue" expansion. ISSOT Oakland seems to be taking the lead in providing customers with parts that help them to avoid costs of new procurement. Of 26,711 inquiries for parts that ISSOT Oakland received in the last fiscal year, it was able to satisfy 24,015 or approximately 90% of the requirements.[Ref. 24]

This is a significant statistic. It indicates that there is perhaps a completely different direction that the IMR program should focus on; i.e. marketing itself as a provider of virtually cost-free parts to all ships going through overhauls and as a provider of last resort for operational units with critical material shortages.

Providing parts to the fleet does not come without cost. ISSOT still must pay its contractors to pick, pack and ship the parts. Overhead rates are especially affected by the extra administrative burdens of dealing with fleet requirements for follow-up messages on priority items. ISSOT Portsmouth estimated that

to process its 636 customer requirements, it incurred a cost of $2,805, mostly in additional overhead.[Ref. 30] The parts Portsmouth filled were primarily for work-stoppage priority items not available elsewhere in the supply system. The $4.41 per line item cost to retrieve and ship a priority part however, seems a fairly reasonable price.

If customers were requesting parts on a lower priority basis on a floppy disc compatible with the ADP equipment at the ISSOT sites, the extra overhead cost per unit to process the material would be negligible. Since ISSOTs were established as fully reimbursable programs, the costs associated with pulling and shipping the parts could be passed on to the customer.[Ref. 34] This is already being accomplished at Oakland but at a very low level. The program needs to advertise how the fleet can acquire these assets for virtually nothing.

Enhancing the cost avoidance feature of the program has a few drawbacks from a supply perspective. NAVSUP will receive less credits for material that is passed back into the system. More parts would be going directly back to the same kind of customer from whence they came in the first place. The type commanders

and other end users will be happy because they are avoiding costs, but NAVSUP may not be happy because it is losing funding.

The other drawback is that demand for the parts wouldn't be recorded in the supply system. Lack of recorded demand could affect stockage levels for parts. However, a mechanism could be eventually developed to record demand for parts issued to customers in this way.

C. OTHER ALTERNATIVES TO THE IMR PROGRAM

The next four subsections will develop alternatives to the IMR program for disposing and processing of low dollar excess.

1. Alternative I: Disposing of Low Dollar Excess at Sea

At first glance, the most economical method of disposing low dollar value excess may be to just let the sailors throw the material over board. However, two considerations must be made prior to implementing this imminently practical method of low cost excess parts disposal:

- The price level at which to throw parts away versus turning them in.
- External issues such as the environment and political ramifications.

a. Determining the Price Level

AT Code 7 material encompasses a wide range of parts with most of the items costing less than $20 (See Table I). From a purely economic standpoint, any part that's value is less than the cost to process it back into the system should be thrown away. It makes little sense to spend $5 to place a $.05 part back into the supply system.

The unit cost for processing material back into the supply system was calculated in chapter III. Depending on which coast a ship is on, it could cost either $4.12 or $5.15. DLA calculates that every item turned into disposal costs $5.31 per unit to process.[Ref. 35] Additionally, throwing a part over the side means that the item does not need to be carried ashore. Depending on the vessel, carrying parts ashore may be a very labor intensive exercise. Assuming that a similar mix of labor and manhours is required onboard the ship as at the ILO site to move the material ashore, then another $.74 would be added to the cost of moving material from the ship to shore (See table IX). Therefore, any parts less than the combined costs ($5.31 + $.74 + $4.12 or $5.15) should not be considered for turn-in, but rather disposed of into the nearest dumpster. Referring back to the

offload quantities in chapter II, table I, there are approximately 4000 parts costing less than $10.

$$4000 \times (\$4.12 + \$.74 + \$5.31) = \$40{,}680$$
$$4000 \times (\$5.15 + \$.74 + \$5.31) = \$44{,}800$$

The above amounts would need to be adjusted for the value of the 25% of the material that would have been reutilized by DoD (from Table I, the value of material less than or equal to $10 is $27,950 x .25 = $6988) minus the 14% of the remaining material that would have been used by other federal services ($27,950 - $6,988 = $20,962 x .14 = $2,935). The cost savings of disposal at sea for an average submarine tender would be $30,757 ($40,680 - $9,923) or $34,877 ($44,800 - $9,923), depending on which coast it is operating on.

Throwing material away whose value is less than its processing cost can be justified in another manner. In fiscal year 1989, 75% of all material handled through the Improved Material Returns (IMR) program went to DRMO.[Ref. 35] From a narrow parochial perspective, since the U.S. Treasury receives the proceeds from DRMO and not the Navy, it is essentially "throwing away" the parts.[Ref. 36] The 25% of the material left over doesn't generate large amounts of credit for the Navy either. Some of that material includes parts that are turned into the item manager without

credit. In fiscal year 1989, only 11.2% of all the less than $20 extended money value material turned into the system actually produced credits.[Ref. 17][Ref. 18]

b. *Externalities*

Issues such as the deliberate disposal of perfectly good government material at sea cannot be considered in a vacuum. The Navy would not be meeting the spirit of the Defense Utilization and Disposal Manual to

> "promote maximum utilization of supply systems stocks, excess, surplus and foreign excess personal property and refined precious metals.."[Ref. 37]

Environmentally and politically, throwing away good parts may be hard to justify.

AT code 7 material tends to be small items, generally rubber o-rings, fuses and other like material, all of which are very non-biodegradable. Recently, in an effort to show its environmental sensitivities, the Navy banned the dumping of plastics at sea.[Ref. 38] Rubber would fall into a similar category. Additionally, there are numerous hazardous materials that fall into the AT Code 7 category, from small containers of solvents to asbestos seals. Therefore, shore disposal would be superior to at sea disposal. If the supply officer has to take the material off the

ship, then he is incurring the same relative costs as taking the material to the ILO site, thus nullifying the additional $.74 saved by disposal at sea.

The political consequences may be much more extreme than the environmental ones. In an era of declining budgets, it would be political suicide to be perceived as "wasting" government resources. The symbolic significance of such "waste" would more than overshadow the economic rationale for such actions. The appearance of waste would be loudly exploited by opportunists with another agenda for dollars spent on national defense.

In summary, although disposal at sea probably makes lots of economic sense, it would most likely be politically infeasible and environmentally irresponsible.

2. Alternative II: Turning All Low Dollar Excess into DRMO

A variant of the disposal at sea strategy for the lowest cost excess (which has been identified as material below the $10.00 range) is to turn all such material into DRMO, the "official DoD dumpster site." There material can be sold on the outside market or transferred to other governmental agencies.

This strategy has a certain amount of promise to it. Approximately 75% of the less-than-$20 parts end up going to DRMO anyway. By going directly to the DRMO from the ILO site, all of the intermediate processing steps would be eliminated. However, the savings from sending the material directly to DRMO must be balanced out against the cost of replacing the 25% of the less-than-$20 material that would have gone back into the system. Assuming that the ILO costs would still be incurred regardless of whether Alternative II or the status quo were chosen, $2.45 or $3.48 per unit would be saved ($4.12 or $5.15 minus $1.67 ILO site costs). There is a transportation charge to move material to the nearest DRMO. Based on figures from NSC Charleston, the cost to move one unit of material was **$.05**. Subtract $.05 from the unit cost above to calculate the potential unit cost avoidance ($2.40 or $3.43). Multiplying the number of items received in fiscal year 1989 at each of the two IMR sites times the unit cost saved would generate the gross cost avoidance. Subtracting out the replacement cost of the 25% material that would have gone into the system will give the total net savings. These costs are outlined in the Table IV:

TABLE XV: Direct to DRMO Savings	PORTS	OAKLAND
Cost avoidance going directly to DRMO	$2.40	$3.43
Number of parts received <$20	176,373	195,920
Gross cost avoidance	$423,295	$672,006
25% of parts received	44,093	48,980
Average cost of mat'l <$20	$7.28	$7.28
Replacement cost	$320,999	$356,574
Total Net Savings	$102,296	$315,432

The average cost of material less-than-$20 was computed using the same unit cost derived at the beginning of the chapter, $7.28. New procurement would add additional administrative costs on top of the replacement cost of the material in Table XV, possibly reducing the savings to a significant degree.

A possible offshoot of this strategy would be to send material to DRMO that is not classified a repair part. Some of the material that winds up at the ISSOT site is consumable material such as wrenches, pens, pencils and other low cost items that aid in the daily operation of ships and offices. Parts could be segregated by cognizance code and only those items that are specifically designated as repair parts would be forwarded on to the IMR sites. By eliminating many of these peripheral parts, the ISSOT could concentrate on moving the more important material back into the supply system.

This alternative could be used in combination with other strategies discussed in this chapter. In any case Alternative II avoids the political liability of throwing away parts, and the associated environmental problems.

3. Alternative III: Establishing An Excess "Servmart"

The large number of requests for parts from other commands that ISSOT Oakland was able to fill indicates that much of the material that goes through the IMR program is still used in the fleet. Unfortunately, the fleet sailor who knows his/her requirements does not have much access to the material in Oakland and Portsmouth. This situation could be rectified by establishing a form of "excess Servmart" where the material could be handled much like it is at Oakland and Portsmouth, only the sites would be spread out among the naval bases with the largest concentrations of ships. Ships would be allowed to send representatives into this servmart to search for required materials. The same data base currently in effect at the ISSOT sites could be maintained against which queries from outside organizations could be processed. The potential payoff for the Navy is in the form of cost avoidances to the customer.

Although the data is somewhat scarce, if the experience of Oakland is any indication, the amount of cost avoidance would eclipse the amount of credit the Navy Supply System would accrue. According to Mr. Ken Whitney, a former Navy chief who now works for CACI at their San Diego field office, when the excess lists for one of the platforms he worked on were thoroughly analyzed, about 30% of the "excess" parts were ultimately still required onboard the same ship.[Ref. 39] The parts had become excess through stock number migration or imperfect COSAL maintenance.

The type commanders have already established some precedent for "excess Servmarts" in their "mini-supply systems" which they operate for high value excess apart from the supply system. Perceiving that they were not being treated fairly in the turn-in program, TYCOMs on both coasts have set up their own stocks of high value excess parts. SUBPAC, SUBLANT, SURFPAC, SURFLANT all have some variation of these programs, which they justify by the amount of cost avoidances they generate. However, TYCOMs have avoided the low end of the excess spectrum.

Two costs would be primarily associated with this alternative: the transportation cost to the servmart site and the operating cost for the servmart itself. Transportation costs would

be minimal for the majority of platforms since an excess servmart would be located at all the major naval installations. Operating costs would be significant. The operating cost for a major Servmart, such as the 32nd Street Naval Station Servmart in San Diego, is approximately $212,900 per year, not including the cost of the facility.[Ref. 40] An estimated seven excess servmarts could be operated for the same costs estimated in Table XIII for the status quo.

However, there are several major problems associated with this approach. The excess servmarts would need to return greater than 30% of their incoming excess parts back to the fleet to equal the revenues or cost avoidances of the current IMR program. Additionally, the availability of facilities is questionable, given the current crowded conditions at most naval bases and supply centers. If there were at least three such servmarts on the west coast and they split the approximately 195,000 parts that the Oakland ISSOT received last year, each would be managing some 65,000 parts each year or approximately 16,000 line items (4:1 ratio of parts to line items). The 32nd Street Servmart handles only 2,954 line items. The large amount of unknowns require

further analysis and study prior to its adoption as an alternative.

4. Alternative IV: Commercial Operation of the Excess Material System

An alternative to continuing Navy involvement in the excess business would be to allow a private contractor to handle low cost excess from "cradle to grave". The contractor could come aboard a Navy vessel, take the parts off the ship, catalogue the parts, and offer parts the Navy requires back to the Navy at a price which includes some sort of reasonable profit. The parts which have little usefulness to the Navy could be sold by the contractor on the open market.

Although the exact form of the program may be difficult to define, there are several savings that could result. Most of the costs of taking excess off the ship and routing it through the current network would be saved. There would still be some administrative costs because ship's personnel would be involved in opening up storerooms and guarding against contractor theft of parts, etc. The entire IMR program would be eliminated and there would be reductions of workload at ILO sites across the country. If there is contractor enough interest in the program, contractors

could bid against one another to offload low cost excess from ships.

Contractor interest in the idea, however, has not been overwhelming. Inquiries made with six contractors currently engaged or interested in Navy logistics work, yielded no positive responses. SEACOR, the previous holder of the ISSOT contracts, felt that there was too much risk involved in such an arrangement.[Ref. 41] Investment in infrastructure would be excessive with little opportunity to recover costs. Additionally, SEACOR felt that the market for excess parts would be very limited.

What is more appealing to contractors is an extension of the current ISSOT contract where the contractor would handle all of the excess disposal on a Time and Materials contract basis. The Navy would pay the contractor to take the material off the ship and put it into location at a Navy facility. The contractor would push material back to the system the same way the IMR program currently works. The Navy would recoup its investment in the contract through the amount of credits received from the IMM. The Navy would completely stay out of the excess business and let the contractor handle all facets of material processing,

including the ultimate disposal of material going to DRMO. The savings from this alternative would be threefold:

- The ship would not have to move any parts off its shelves. This is a savings of approximately $.74 per item applying the same labor rates on the ships as at the ILO site (See Table IX).
- ILO site and NSC costs would be avoided for a total of $2.35 per unit (See Table IX costs for ILO and NSC).
- The IMR overhead costs of $104,800 for the last fiscal year would be saved. Averaging the overhead over the number of parts received during last fiscal year yields a unit cost of $.28.[Ref. 24][Ref. 25]

The total savings per unit part would be $3.37.

The unit savings would have to be compared against the increased unit cost of the ISSOT contract. Although no contractor is willing to give detailed cost figures at this point, rough estimates of $3.00 per binned item and $5.00 per bulk item were provided to move material from a ship to a storage location.[Ref. 41] The vast majority of AT Code 7 items are small and fit into a bin. Therefore, most of the material would fall into the $3.00 range. The savings would then be $.37 per part. Multiplied by the 372,293 parts received at both ISSOTs during the last fiscal year would provide a total savings of $137,748. However, due to the lack of concrete cost data from the potential contractors, the total

savings are small and subject to error. Even if the cost of complete commercial operation of the low cost excess material equalled the status quo, the Navy would be out of the low cost spares business and could apply its human resources in other areas of need.

5. Comparison of Alternatives

Several alternatives to the IMR program have been introduced in this section. Clearly, some of the alternatives are superior to others. Direct transfer of parts to DRMO has the most quantifiable cost savings and could be implmented with little problem. Establishment of excess servmarts would be difficult to implement and there are several uncertain variables in the costs. Commercial operation of the low cost excess material system appears to save few costs in relation to the present system. Disposal of parts at sea has environmental and political drawbacks and is probably the least desirable of the alternatives.

CHAPTER V: CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Low cost excess material presents the same kinds of problems encountered with more valuable parts; namely, what to do with the material once it is no longer needed. Although the total dollars and amounts involved in the procurement and distribution of allowance type code seven parts are relatively small when viewed against the enormity of the money invested in the more expensive Navy inventory, this is still an area where increased efficiency can produce quantifiable savings.

As a result of the analysis in this thesis, several conclusions were derived concerning the low cost excess disposal system and the IMR program. The primary conclusion is that although the IMR program appears to pay for itself, from a system-wide perspective, it does not. Two costs drivers were identified in the low cost disposal system: the contract costs at the ISSOT and the holding costs of the material enroute to the ISSOTs. Any efforts to streamline the contract costs at the ISSOT site will result in the most significant savings. Holding costs are a function of holding

time and the applied holding percentage. The only significant area where the system can improve holding costs is by reducing holding time at each of the stages that material passes through.

When the source of low cost excess material is close to the ISSOT, the process is already streamlined by the direct movement of parts to the ISSOTs without additional handling at the local supply center and additional transportation charges. Distance is critical, especially considering the large variance in the costs between the two ISSOTs. Depending on the transportation costs, more material should be processed at Portsmouth than Oakland to take advantage of the 37% difference in contract costs.

Inefficiencies were uncovered which can be modified to improve the cost-effectiveness of the system. The current system has three primary shortcomings:

> **First**: The current system for less-than-$20 excess parts fails to check material for turn-in to the Defense Reutilization Management Office (DRMO) until it has passed through the entire network resulting in additional investment in parts that are not going to be reutilized by the Navy.

Second: There is a lack of consistency in the amount of queries to the item material managers between the two Improved Material Return (IMR) sites. This appears to have resulted in a large and growing inventory at the Oakland ISSOT site. The costs of managing such an inventory are large, and NAVSUP is not receiving any benefit from material sitting in storage.

Third: There is little fleet visibility of the assets which are contained in the IMR program, therefore limiting the potential for reutilization of the material.

As a result of the deficiencies above, five alternatives were introduced with the following conclusions:

ALTERNATIVE 1. Modifying the existing system:

Modifying the current system offers the most tangible benefits. Three modifications can increase cost-effectiveness:

- Segregate material destined for DRMO at the ILO site or at the local supply center.
- Establish a uniform policy for querying the item manager about item disposition.
- Provide the fleet with information about the inventory.

- Streamline the entire process by loading material into containers that can be put directly onto the shelf at the ISSOT site.

The modifications above have the following advantages:

- The IMR program can be made more cost-effective with minor changes to the procedures in effect.
- Material sent directly to DRMO will incur lower system processing costs.
- Segregating out material destined for DRMO at the ILO site can be accomplished relatively easily and with only a small additional investment in equipment.
- A uniform policy for querying the item manager would standardize querying rates and raise potential credits for NAVSUP while shrinking the inventories and the size of the IMR sites on both coasts.
- Providing on-line ADP access to the fleet would broaden the customer base for ISSOT material and improve the cost avoidance feature of the program.
- Establishing a system whereby the material from the ILO sites can go directly on the shelf at the ISSOT without further handling will lower labor requirements and should result in a reduced contract cost.

The primary disadvantage to this approach is that increasing the number of parts sent directly to DRMO may reduce the opportunity for fleet reutilization of some of the assets. However, the advantages far outweigh the disadvantages and make this the

most viable of the options. All of these modifications would increase the system effectiveness and reduce costs.

ALTERNATIVE 2. Send all material directly to DRMO rather than the IMR site:

There are several readily apparent advantages to sending material directly to DRMO:

- All the costs of getting the material to the IMR site would be eliminated
- Most of the material would go directly to its ultimate destination
- All the costs associated with running the IMR program would be eliminated
- It would probably be the easiest of the alternatives to implement

The drawbacks to directing all the less-than-$20 material to DRMO are:

- There would be no parts available for fleet reutilization
- The 25% of the material that would have gone back into the system would now have to be procured

The savings from going directly to DRMO are quantifiable. However, the additional cost of purchasing the approximately 25%

of material that would have gone back into the system is a large unknown. This cost could be substantial, nullifying much of the savings from the elimination of extra processing costs and the IMR infrastructure.

ALTERNATIVE 3. Establish mini-servmarts to redistribute less-than-$20 material excessed from ships:

The advantages of creating an excess "servmart' are several:

- Larger amounts of low cost excess would be utilized by the fleet and the type commanders would incur greater cost avoidances.
- Processing costs would be reduced since material would be staying in the same area as where it was offloaded.
- Costs of maintaining the IMR program would be eliminated.

There are also several disadvantages to this alternative:

- The availability of warehouse space at supply centers is already at a premium and additional space for this alternative may not be readily attainable.
- The reutilization rate of the material would have to be at least 30%, if not higher, to make the program pay for itself.
- Overhead and manpower costs would be higher under this alternative.

The creation of an excess Servmart would return a large amount of material to the fleet. However, the benefits and costs are difficult to measure and make this alternative less attractive.

ALTERNATIVE 4. Contract out for the operations of the less-than-$20 excess material system:

Contracting out the low cost excess disposal system provides several advantages to the Navy:

- The Navy would be out of the low cost excess disposal business and would avoid all the costs associated with the current excess disposal programs.
- Commercial contractors already supply the manpower for the ISSOT teams and extending their control to administration of the program should not prove too difficult.

The disadvantages to this alternative are:

- Without a Request for Quotes or several fact-finding meetings, it is difficult to predict what form of contract would best meet the needs of the Navy and the contractors
- Without Navy control, the program may not be very responsive to needs of the fleet

Until firm contractor prices are available, the benefits of a commercially run excess material system don't appear to be much greater than the status quo.

ALTERNATIVE 5. Disposing of low dollar excess at sea:

Disposal at sea has several attractive features to it:

- It is an easy alternative to implement.
- Processing costs are negligible.
- Significant cost savings can be incurred.

However, this alternative has several major problems associated with it:

- It is environmentally irresponsible.
- The negative political ramifications are significant.
- There would be no reutilization of parts which still have some value.

At-sea disposal may cause more problems than it will solve. The negative environmental and political publicity that would accompany such actions would not benefit the Navy. In the upcoming era of restrictive budgets, the appearance of wasting

parts would be detrimental to Navy funding requests. As a result, this is the least attractive alternative.

B. RECOMMENDATIONS

It is recommended that the Navy evaluate the feasibility of implementing the IMR program modifications presented in this thesis to improve the cost effectiveness of the IMR program. Additionally, it is recommended that the segregation of less-than-$20 material into separate carried and not carried boxes, as practiced at NSC San Diego be eliminated. The separation of the material serves no useful purpose and creates additional work.

Additional research is required into the areas of uncertainty pointed out in this thesis. The primary research requirement is in establishing both a contract type and approximate cost for contracting out the low cost excess disposal functions. Clarification of costs would allow a more accurate appraisal of the commercial operation alternative. Determining a more accurate cost to reprocure parts passed directly to DRMO would also allow for a better comparative evaluation of sending parts directly to DRMO and eliminating the IMR program. The following related topics also require further investigation:

- **Initial Outfitting Models**: Current outfitting models appear to provide an excessive amount of spares, eventually leading to large amounts of excess material. Further research is required to determine how to modify the models to provide the requisite amount of support without generating an inordinate amount of surplus spares.

- **COSAL and Load List maintenance onboard ships**: Additional research is required to find out exactly how much material is taken off platforms that should really stay there. There are indications that some of the excess material on ships may not in fact be excess.

- **Type Commanders' mini-supply systems of repair parts:** An investigation into the payback mechanism for excess material is needed to understand a possible supply system weakness. It appears that type commanders are hoarding excess material from their overhauls. The supply system, if functioning correctly, should inhibit the formation of TYCOM ready spares' pools.

- **Other military excess material disposal systems**: A comparative investigation should be made into the excess material disposal system utilized by other services. A comparison of the program costs and methodologies may prove enlightening and lead to additional alternatives.

- **Contract costs and holding costs**: A streamlined process would lower both contract costs and holding costs. Further investigation into using some of the available technologies to reduce processing time and manual labor would provide additional benefits.

APPENDIX A

PPENDIX A-1: CHANGING THE VARIABLES (# LINES FM 7600 TO 5600)

IO COSTS	PORTS MOUTH	OAKLAND	VARIABLES			
			TRANS	# LINES	# TRIPS	
ANSPORTATION	0.057	0.057	160.64	5600	2	
AP	0.060	0.060				
			E-3 LBR	E-4 LBR	E-6 LBR	#PTS/DAY
BOR	0.738	0.738	100.48	128.64	103.04	450
			TRUCK COST	#LINE PER BOX	# BOXES/ PALLET	# PALLETS PER TRUCK
IPPING	0.003	0.003	220	275	16	16
			COST OF INV	HOLDING COST	# PARTS	# MONTHS
LDING	1.126	1.126	109653	0.230	5600	3
TAL	1.985	1.985				
C COSTS ========			# PERS	HOURS	WAGE	
NDLING (AT'L <$20)	0.006	0.006	5	4.000	10.96	
			VAL>$20	VAL<$20	HOLD COST	# PRTS
LDING (AT'L <$20 & 20 NOT RECVD BY S.D.)	0.295	0.295	54000	19653	0.23	4790
BTOTAL	0.301	0.301				
C. COSTS ($20 KEPT AT NSC)	3.490	3.490	MTIS COST	#PTS>$20		
			3.49	766		
TAL WEIGHTED AVG (<$20 & >$20	0.741	0.741				
			SHIP COST	# LINES/PAL		
IPPING	0.006	0.006	26.00	4400		
TAL	0.747	0.747				
SSOT COSTS ==========	PORTS	OAKLAND	PORTS	OAK	PORTS OVERHEAD	OAKLAND OVERHEAD
ONTRACT COSTS	1.666	2.547	1.32	2.28	0.26	0.117
			DYS HLD	DYS HLD	HLD COST	INV VALUE
LDING	0.113	0.264	45	105	0.23	19653
TAL	1.779	2.810				
RAND TOTAL	4.504	5.536				

APPENDIX A-2: CHANGING THE VARIABLES (# LINES FM 7600 TO 9600)

ILO COSTS	PORTS MOUTH	OAKLAND	VARIABLES			
TRANSPORTATION	0.033	0.033	TRANS 160.64	# LINES 9600	# TRIPS 2	
ADP	0.060	0.060				
LABOR	0.738	0.738	E-3 LBR 100.48	E-4 LBR 128.64	E-6 LBR 103.04	#PTS/DAY 450
SHIPPING	0.003	0.003	TRUCK COST 220	#LINE PER BOX 275	# BOXES/ PALLET 16	# PALLETS PER TRUCK 16
HOLDING	0.657	0.657	COST OF INV 109653	HOLDING COST 0.230	# PARTS 9600	# MONTHS 3
TOTAL	1.492	1.492				
NSC COSTS						
HANDLING (MAT'L <$20)	0.006	0.006	# PERS 5	HOURS 4.000	WAGE 10.96	
HOLDING (MAT'L <$20 & >$20 NOT RECVD BY S.D.)	0.170	0.170	VAL>$20 54000	VAL<$20 19653	HOLD COST 0.23	# PRTS 8286
SUBTOTAL	0.177	0.177				
REC. COSTS (>$20 KEPT AT NSC)	3.490	3.490	MTIS COST 3.49	#PTS>$20 1314		
TOTAL WEIGHTED AVG OF <$20 & >$20	0.630	0.630				
SHIPPING	0.006	0.006	SHIP COST 26.00	# LINES/PAL 4400		
TOTAL	0.636	0.636				
ISSOT COSTS	PORTS	OAKLAND				
CONTRACT COSTS	1.666	2.547	PORTS 1.32	OAK 2.28	PORTS OVERHEAD 0.26	OAKLAND OVERHEAD 0.117
HOLDING	0.113	0.264	DYS HLD 45	DYS HLD 105	HLD COST 0.23	INV VALUE 19653
TOTAL	1.779	2.810				
GRAND TOTAL	3.900	4.932				

PPENDIX A-3: CHANGING THE VARIABLES (# LINES PER BOX FM 275 TO 400)

LO COSTS	PORTS MOUTH	OAKLAND	VARIABLES			
			TRANS	# LINES	# TRIPS	
RANSPORTATION	0.042	0.042	160.64	7600	2	
DP	0.060	0.060				
			E-3 LBR	E-4 LBR	E-6 LBR	#PTS/DAY
ABOR	0.738	0.738	100.48	128.64	103.04	450
			TRUCK COST	#LINE PER BOX	# BOXES/ PALLET	# PALLETS PER TRUCK
HIPPING	0.002	0.002	220	400	16	16
			COST OF INV	HOLDING COST	# PARTS	# MONTHS
IOLDING	0.830	0.830	109653	0.230	7600	3
OTAL	1.672	1.672				
ISC COSTS						
			# PERS	HOURS	WAGE	
IANDLING MAT'L (<$20)	0.006	0.006	5	4.000	10.96	
			VAL>$20	VAL<$20	HOLD COST	# PRTS
IOLDING MAT'L (<$20 & >$20 NOT RECVD BY S.D.)	0.215	0.215	54000	19653	0.23	6560
UBTOTAL	0.221	0.221				
			MTIS COST	#PTS>$20		
REC. COSTS (>$20 KEPT AT NSC)	3.490	3.490	3.49	1040		
TOTAL WEIGHTED AVG OF (<$20 & >$20	0.669	0.669				
			SHIP COST	# LINES/PAL		
SHIPPING	0.006	0.006	26.00	4400		
TOTAL	0.675	0.675				
ISSOT COSTS	PORTS	OAKLAND	PORTS	OAK	PORTS-OH	OAK-OH
CONTRACT COSTS	1.666	2.547	1.32	2.28	0.26	0.117
			DYS HLD	DYS HLD	HLD COST	INV VALUE
HOLDING	0.113	0.264	45	105	0.23	19653
TOTAL	1.779	2.810				
GRAND TOTAL	4.120	5.151				

APPENDIX A-4: CHANGING THE VARIABLES (# LINES FM 7600 TO 9600) (# LINES PER BOX FM 275 TO 400)

ILO COSTS	PORTS MOUTH	OAKLAND	VARIABLES			
			TRANS	# LINES	# TRIPS	
TRANSPORTATION	0.042	0.042	160.64	7600	2	
ADP	0.060	0.060				
			E-3 LBR	E-4 LBR	E-6 LBR	#PTS/DAY
LABOR	0.738	0.738	100.48	128.64	103.04	450
			TRUCK COST	#LINE PER BOX	# BOXES/ PALLET	# PALLETS PER TRUCK
SHIPPING	0.002	0.002	220	400	16	16
			COST OF INV	HOLDING COST	# PARTS	# MONTHS
HOLDING	0.657	0.657	109653	0.230	9600	3
TOTAL	1.499	1.499				
NSC COSTS						
			# PERS	HOURS	WAGE	
HANDLING (MAT'L <$20)	0.006	0.006	5	4.000	10.96	
			VAL>$20	VAL<$20	HOLD COST	# PRTS
HOLDING (MAT'L <$20 & >$20 NOT RECVD BY S.D.)	0.170	0.170	54000	19653	0.23	8286
SUBTOTAL	0.177	0.177				
			MTIS COST	#PTS>$20		
REC. COSTS (>$20 KEPT AT NSC)	3.490	3.490	3.49	1314		
TOTAL WEIGHTED AVG OF <$20 & >$20	0.630	0.630				
			SHIP COST	# LINES/PAL		
SHIPPING	0.006	0.006	26.00	4400		
TOTAL	0.636	0.636				
ISSOT COSTS	PORTS	OAKLAND	PORTS	OAK	PORTS-OH	OAK-OH
CONTRACT COSTS	1.666	2.547	1.32	2.28	0.26	0.117
			DYS HLD	DYS HLD	HLD COST	INV VALUE
HOLDING	0.113	0.264	45	105	0.23	19653
TOTAL	1.779	2.810				
GRAND TOTAL	3.908	4.940				

APPENDIX B

FIGURE V: CHANGE IN UNIT COST VERSUS CHANGE IN HOLDING TIME AT ILO SITE

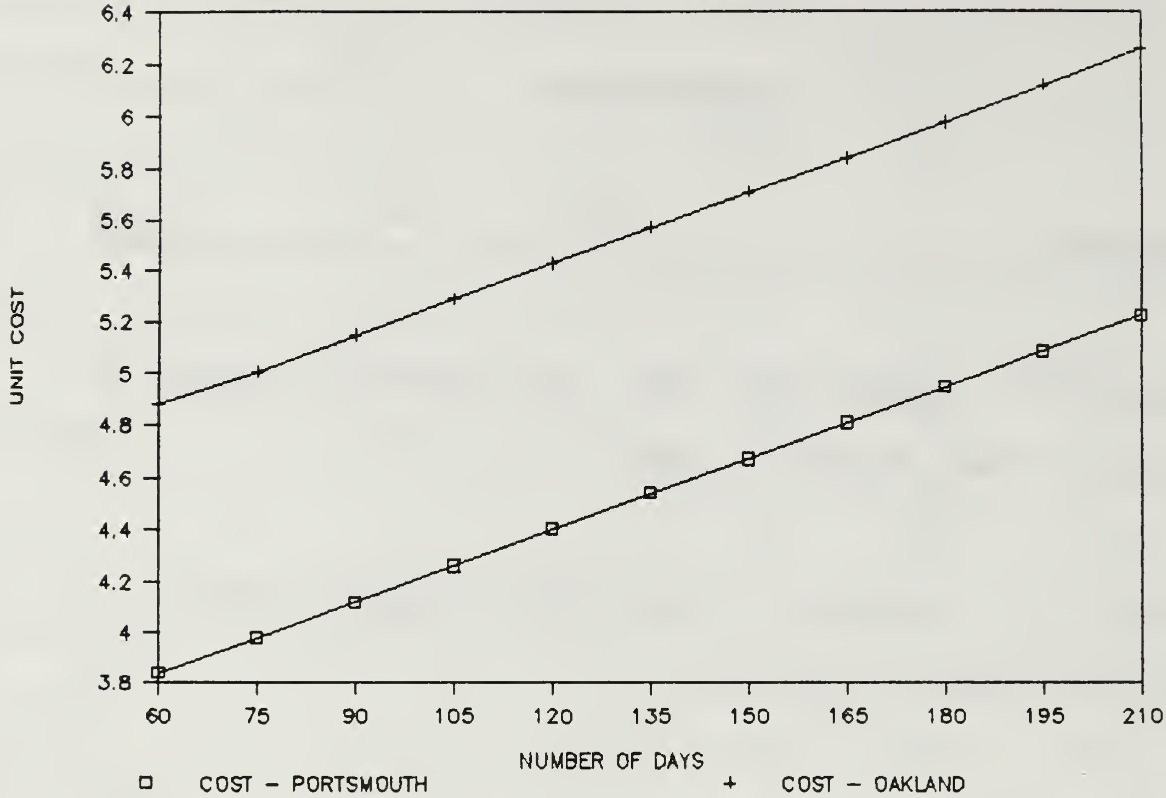


FIGURE VI: CHANGE IN UNIT COST VERSUS CHANGE IN HOLDING TIME AT NSC

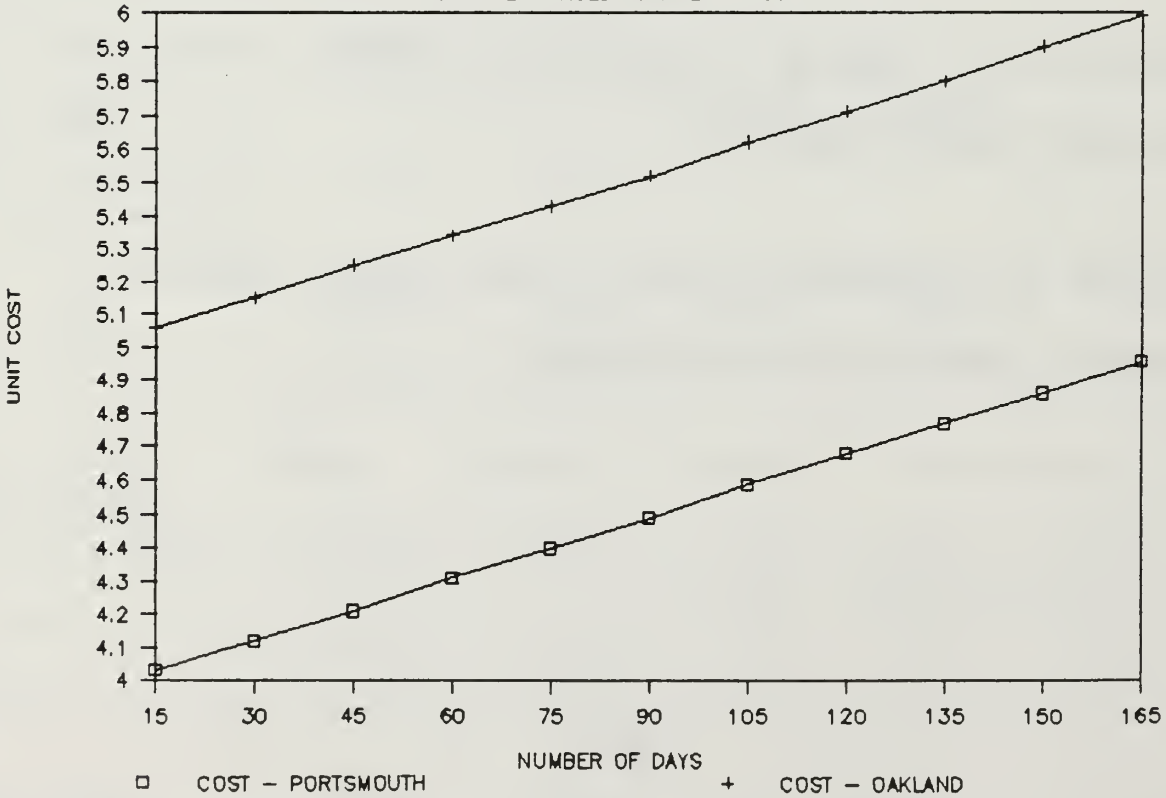


FIGURE VII: CHANGE IN UNIT COST VERSUS

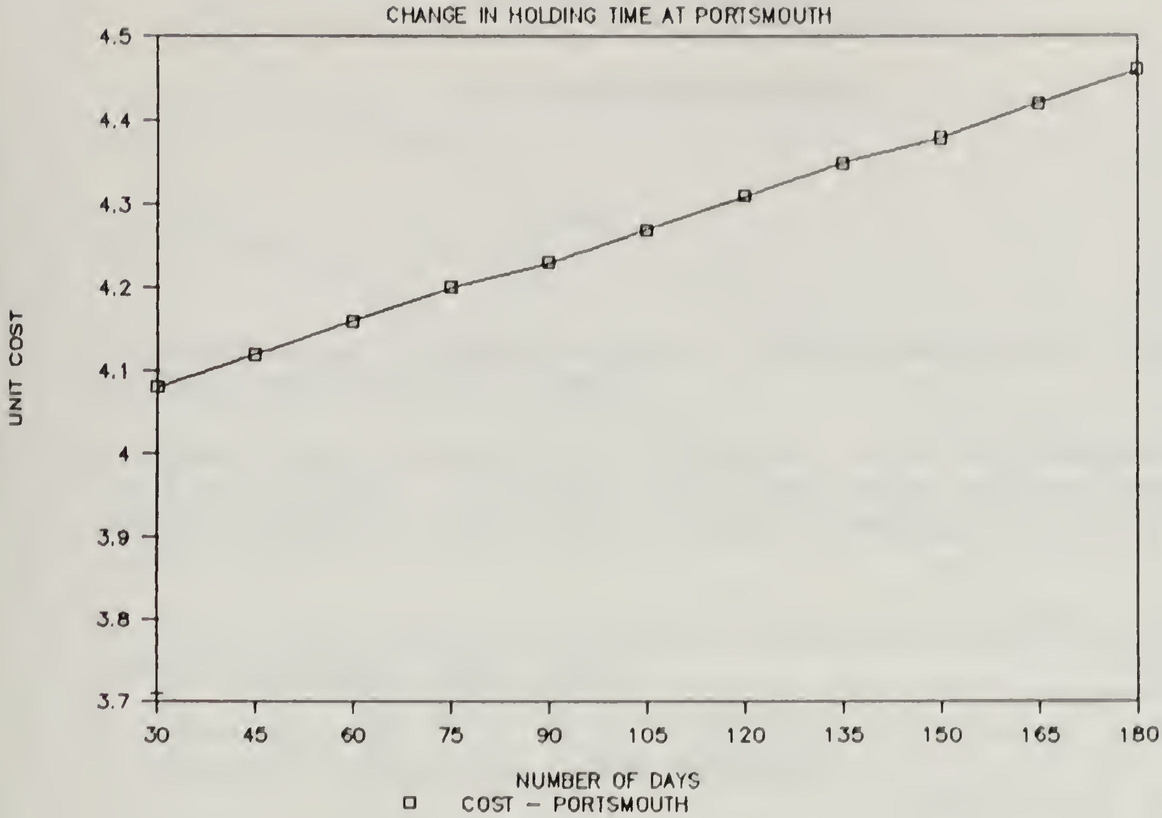


FIGURE VIII: CHANGE IN UNIT COST VERSUS

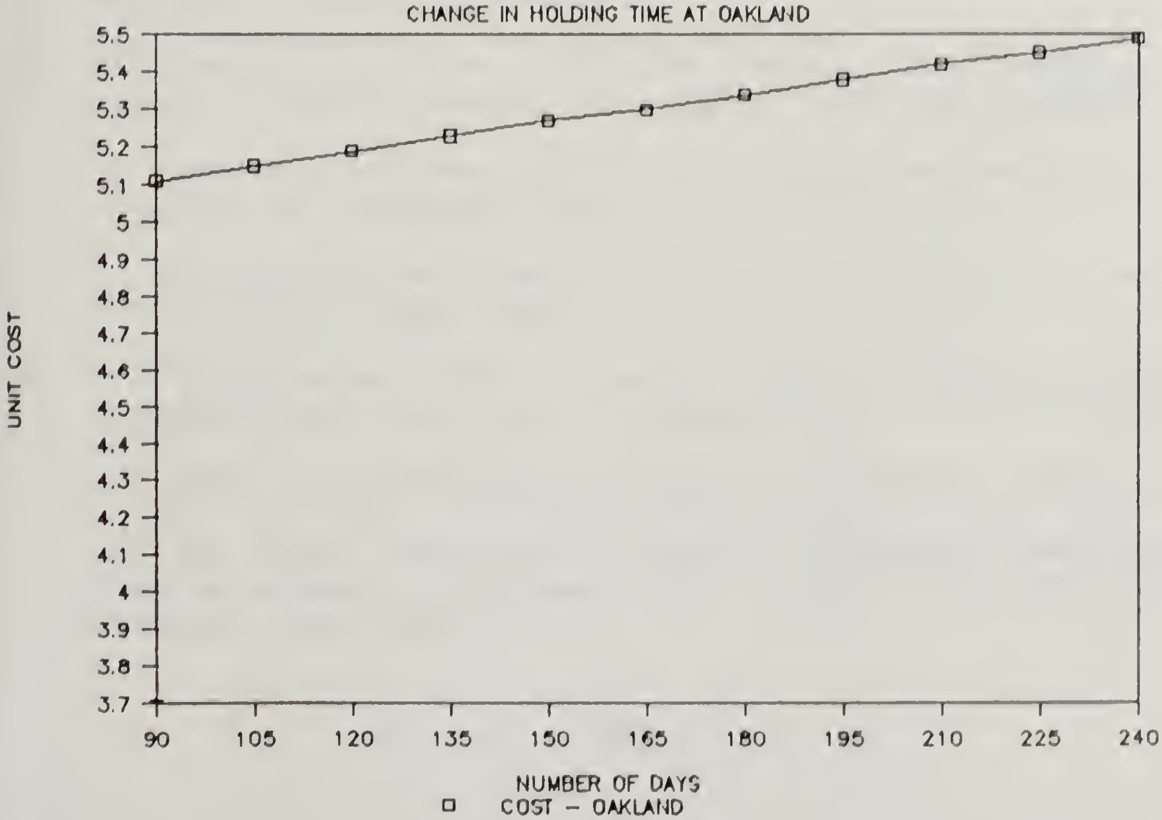
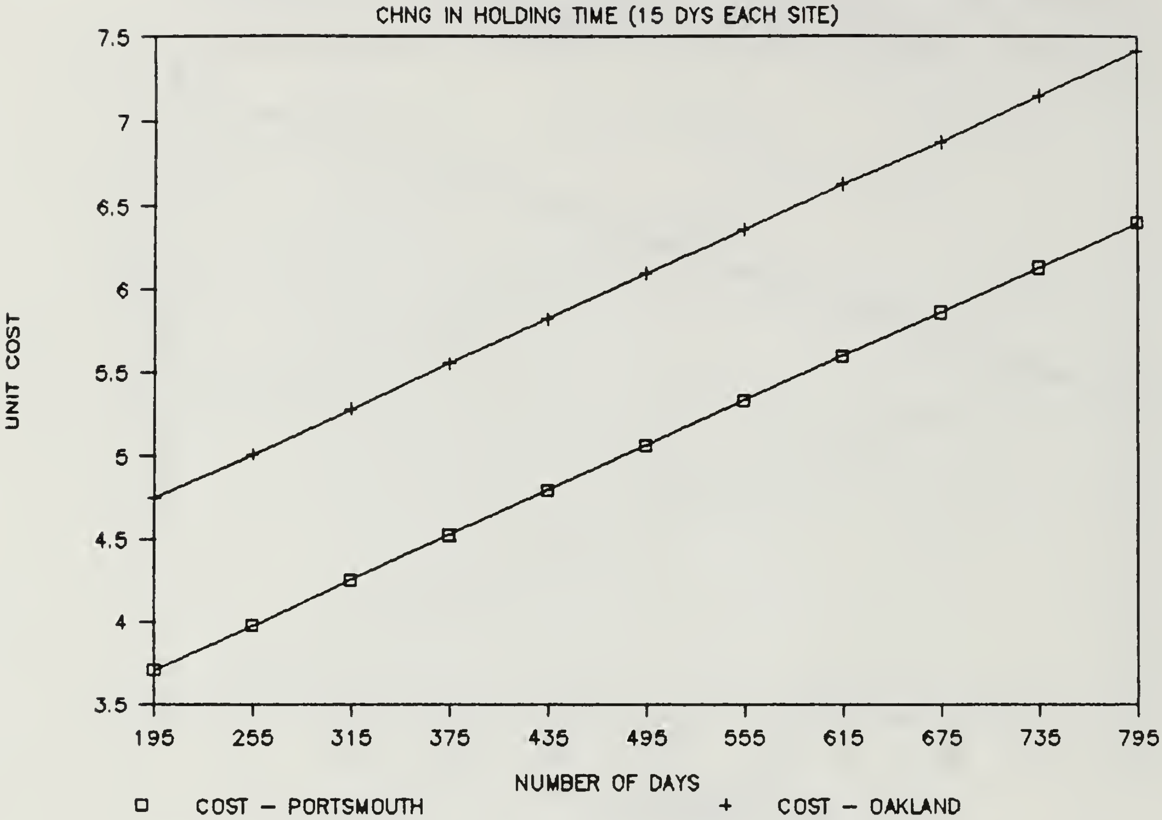


FIGURE IX: CHANGE IN UNIT COST VERSUS



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